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Issue 1 – February 2004

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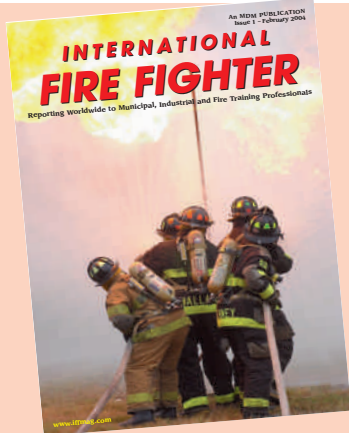
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## COMMENT

Welcome to the very first issue of International Fire Fighter (IFF) magazine. I hope you enjoy the editorial content in this issue as well as finding the product and company profiles useful and informative. International Fire Fighter has been born from the need to produce an industry magazine covering the three main areas of fire fighting, Municipal, Industrial and Fire Fighter training.

To help you, and make the magazine more user friendly, it is split into three different sections each section having a pictorial divider.

Please read through and pass it on to other people in your department and feel free to pass on any comments you may have regarding this issue as well as any suggestions for content in future issues. Please also remember, to mention International Fire Fighter when responding to our advertisers. I look forward to hearing from you.

Mark Bathard  
Sales and Editorial Manager



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**Bronto – heading upwards, with its feet firmly on the ground.**







By Phil Gerace, Director of Sales and Marketing, KME Fire Apparatus

# The Apparatus Decision

The purchase of new fire apparatus is not only one of the largest financial decisions made by a fire department; it is also a decision that will affect the department's operational capability for decades. That is why it is critical that such a decision be made by using a process based upon current information rather than upon emotion or past practice. A small investment in apparatus research can pay off huge dividends for those organizations that make the effort.

The first task is to decide the general capabilities required of the apparatus. This is not a decision about how much horsepower is needed or how high the crew roof should be. Instead it's an honest accounting of what will be the mission of the apparatus. Will it need to carry rescue tools? Is foam capability required? In the case of an aerial, what kind of access restrictions will be encountered within the Department's protection district? What challenges do local streets and inclines present? In short, what will be demanded of the truck both today and in the future?

Once a basic agreement has been made as to the general capabilities, an apparatus committee is often formed. It's a great system that should consist of a variety of personnel with different operational backgrounds that include individuals with procurement, mechanical/service, and fire ground experience. The challenge is finding sufficient diversity without making the group larger

than about five people. Larger groups are often burdened by spending more time on the dynamics of working on committees than on the task itself.

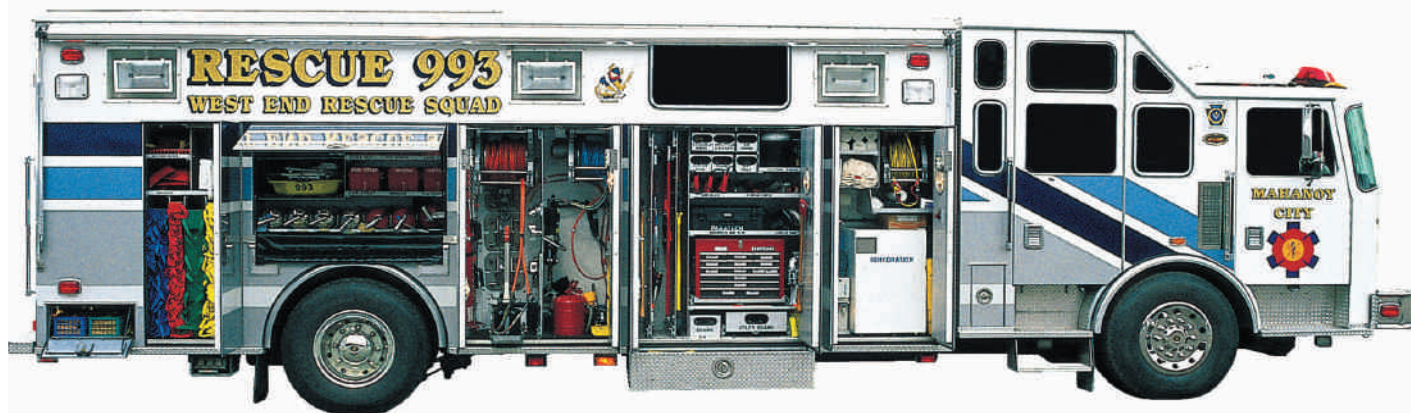
If new apparatus hasn't been purchased within the last five to seven years, when a Committee is assembled, it is important that some or all of them schedule visits with several fire apparatus manufacturers. This will allow them to make fair and accurate comparisons between industry suppliers, but more importantly will provide the decision makers with important information about new technologies and popular options that can be included in the specification that will be released by the fire department. Another alternative to the plant visit is a national tradeshow. Here you can speak with both apparatus manufacturers and component suppliers for the most up to date information. A cur-

rent list of major fire service tradeshow can be found on the Fire Apparatus Manufacturer's Association's website at <http://www.fama.org/Site/Calendar/>.

When the Committee has been formed and they've made their visits, the next step is to begin writing a specification. NFPA 1901, 2003 Edition includes an Annex B entitled "Specifying and Procuring Fire Apparatus". The forms within this annex can be useful tools to make sure that all relevant areas of the apparatus are considered when writing the specification, as well as insuring that the spec will result in a truck that meets the NFPA minimum standards. The forms include procurement issues, apparatus dimensions, operational conditions, equipment, chassis components, electrical systems, crew areas, body compartments, fire pump, water tank, aerial devices, foam



Pic courtesy of KME Fire Apparatus



*Pic courtesy of KME Fire Apparatus*

systems, command and communications, air systems, and winches. All major areas are covered, but the Apparatus Committee must still decide the configuration to bid, the manufacturers' warranties being requested, special support requirements, inspection trips, and the specifics of the bidding process. It is important to note that the decisions made at this point have a significant affect on the final price of the vehicle and the number of bidders.

As the Department configures the apparatus specification to meet their needs, how far they stray from the industry "norm" and from the "standards" of each manufacturer will affect the overall bid price. For example, it's fine to specify overall dimensions and placement of components, but trying to micromanage compartment dimensions or trying to pre-plumb the pump by noting overly specific plumbing restrictions either increases the cost of the truck or decreases the number of bidders. However, at the other end of the spectrum, following any one manufacturer's norms or suggested specifications too closely can often also lead to increased prices and decreased bidders. When a department writes a specification that includes items like the number of fins in a radiator, the exact alloy or dimensions of an extruded support member, or any other proprietary verbiage from a specific manufacturer, it is telling all potential bidders that the bid will somehow favor a particular bidder. This not only decreases the number of potential bidders, but of those suppliers that do bid, they must increase their price to meet that particular spec item.

Areas like extended warranties or special service requirements should also be considered. While these requirements can add significantly to the overall price of the vehicles when the department is bidding only one or two trucks, on multiple unit bids, the overall cost is usually heavily discounted. If you want a five

year bumper to bumper warranty or the truck representative to transport the vehicle at no charge to his service center under warranty, now is the time to write that into the spec. Remember, the Fire Department has to live with these decisions for a decade or more, so they must think carefully about what's best for the long term.

Inspection trips are another factor that contributes greatly to the overall acquisition cost. The Apparatus Committee can choose to bid them as part of the overall price, bid them as options, or pay for them out of the Department budget. If they're included in the bid, make no mistake the Fire Department pays for these trips. The frequency and group size of these trips varies from department to department so there is no industry standard. It is recommended that at least two (and usually three) trips take place. The first trip should be the Pre-Engineering or Pre-Construction Conference. This is a meeting in which the manufacturer discusses exactly how they plan to implement the solutions to each of the requirements in the bid. There are opportunities to get suggestions from the manufacturer about changes that might better satisfy the Department's needs. There are also usually questions asked that the department might not have considered, so every decision may not always be made during the meeting. The apparatus com-

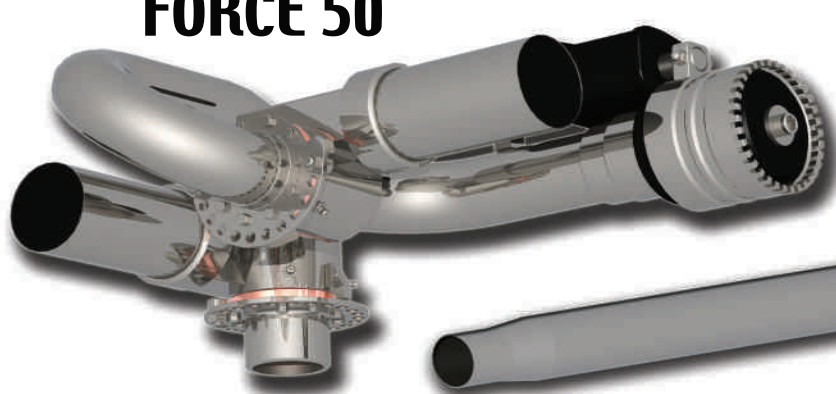
mittee should also be aware that this is a meeting in which it's important to make any remaining changes to the spec. Cost changes at this point are minimal, however at future points during construction, changes may either be very expensive or not even possible. The second trip is usually a trip just before the unit goes into paint. This allows the Committee to see a finished body, but still allows for a moderate amount of changes. The last trip is usually either a 90% or 100% final inspection. At this point the apparatus is painted, assembled, and all major components are installed. The unit is either done or having the last few trim items completed. Bring as many Committee members as possible on this trip. Have everyone either agree that the truck meets spec and will fill the needs of the department, or make whatever changes are necessary (i.e. additional steps, lights, or switches) so that when the apparatus arrives at the station, it receives the full support of the committee. One of the biggest mistakes made at this final inspection trip is not allowing sufficient time to review the apparatus. It is recommended that committee members go line by line through the specification, making sure that all items and changes are covered. Once the truck is in the station is not the time to mention that the Fire Department thought there would be an extra light in one of the



*Pic courtesy of KME Fire Apparatus*



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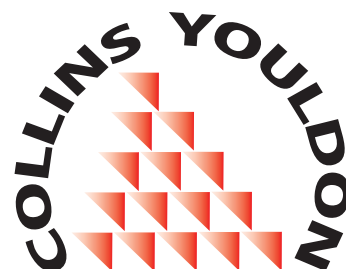
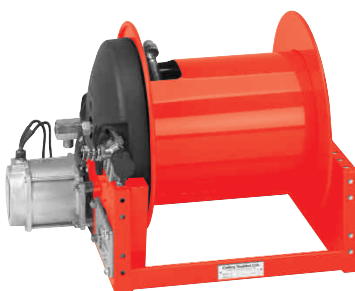
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compartments. Once again, attention to detail is important since what the committee accepts at delivery will be part of the department for years to come.

The specifics of the bid process should be carefully considered. At a minimum, a 100% performance bond should be required to make sure that manufacturers without the financial stability to stand behind their products and warranties will not be considered. Bidders should be given at least four weeks to prepare a bid. If the Department is bidding multiple units, it might also pay to have a mandatory Pre-Bid Meeting. This allows potential bidders to view the specification ahead of time and air specific questions or complaints about items that in their view lack clarity, conflict, or greatly favor another manufacturer. This meeting will really help the bidding Department hone their specs and at the very least, helps to minimize protests at the time of award. It is also critical to make sure that all bidders clearly and explicitly state any and all exceptions to the specification at the very beginning of their bid.

A specific date and time should be announced for the receipt of bids. How such receipts are handled should be up to the Department's legal counsel, but to have a meeting to announce the results of these bids is often a waste of time. One should expect that bid numbers will vary greatly and often because of the number of exceptions taken. If a particular manufacturer has partially or completely ignored the department's specification, the department may not want to give a "false impression" of that manufacturer being "low bid" to the department, other bidders, or other interested parties. Unusually low bid numbers may at times seem attractive in certain political agendas, thereby causing pressure to purchase apparatus that does not meet the needs of the Fire Department. However, if the Apparatus Committee has done its job, the spec



Pic courtesy of KME Fire Apparatus

BIDS	RFPs
Open at specified time and date, publicly read bidder's name, price, items offered, F.O.B points, delivery, etc.	Close at specified time and date; read only the names of suppliers submitting proposals.
No discussion with bidders allowed.	Discussion with suppliers permitted with restrictions specified prior to the submittals.
Evaluate against specifications.	Evaluate against evaluation criteria and against competing proposals.
Entire procurement public record.	Awarded contract public record.

and compliant bids should be the only considerations and can be defended to those with a financial concern as their primary interest. If this is a major concern however, the Fire Department may choose to do a Request for Proposal (RFP) instead of a bid. Above is a comparison chart of the major features of each.

Evaluation of the final bids or RFP's can often be confusing because typically, even when the Fire Department requests it, bids are generally not in similar order. One method to evaluate bids is a points system. Points are either awarded or deducted for spec compliance or lack thereof. Extra points may be awarded for exceeding specifications. This point system is often weighted and

can be somewhat complicated. An easier method is to simply first, evaluate all bids for compliance. Remove any bid that does not comply on a specification that is substantive. Then have everyone on the Apparatus Committee review all remaining bids. Obviously the lowest bid will receive the greatest attention, but remember low bid isn't always the most responsible bid. Carefully consider the past experiences or reputations of vendors in terms of quality, service, and delivery. Look for a well prepared, logical, and professional bid. If the vendor isn't able to organize the bid properly, can they really build the truck properly. In short, find the bid that best meets the needs of the Department both financially and operationally.

*A specific date and time should be announced for the receipt of bids. How such receipts are handled should be up to the Department's legal counsel, but to have a meeting to announce the results of these bids is often a waste of time.*

Once the final award decision is made a new process begins with both opportunities and pitfalls in the manufacture of the new apparatus. This process too should be done with thoughtful research and the ability to stay true to the stated needs of the Fire Department. If the Department has done its homework up front though, they will be adequately prepared to face all remaining challenges.



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A large red airport emergency service truck, a Scania model, parked on an airfield. The truck has "6" on its side, "CAAS" on the front, and "Airport Emergency Service" written on the side. It has a large white crane-like arm mounted on top. In the background, an airplane is visible.

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*The Partner K650 Rescue is a smaller and lighter machine that fits in most types of rescue vehicles.*

*Easy start and the specially designed starter handle with room for heavy gloves make our cutters really easy to start. Reliability is increased considerably, since the Active Air Filtration System is protected inside the casing and the cutting arm has a sealed drive belt. The chromium plated blade guard, which is visible in smoke, steam and water spray, makes operations much easier to control.*



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Engine	Air-cooled 2-cycle engine
Displacement	94 cc/71 cc
Power	4,5 kW/3,5 kW
Weight, without fuel and blade	10,4 kg/9,1 kg
Cutting equipment, blade:	
Diameter	350 mm (14")/300 mm (12")
Cutting depth	125 mm (5")/100 mm (4")

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# RESCUE TOOL ROUND UP

For years, rescue tools have been essential equipment in a fire fighters arsenal. Over the next three pages IFF takes a look at the current technology available from some of the worlds leading manufacturers.

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AMKUS, Inc. occupies a unique role in the marketplace. We have become known as the only company dedicated exclusively to the manufacturing and marketing of hydraulic rescue tools. At AMKUS, we are 100 percent dedicated to the complex needs of extrication, and maintain our focus on developing the finest hydraulic spreaders, cutters and rams. These tools are used by fire departments, rescue squads, civil defense, emergency medical teams, etc. to free people who may be trapped in wrecked vehicles or under collapsed buildings and debris.

We are honored to be the rescue system of choice for many auto racing bodies and raceways. It is a testament to our enduring product quality and customer service that they have specified our tools for their demanding extrications. It is, however, an even greater honor when an individual fire department weighs the facts and judges our products superior for their needs and the people they protect.

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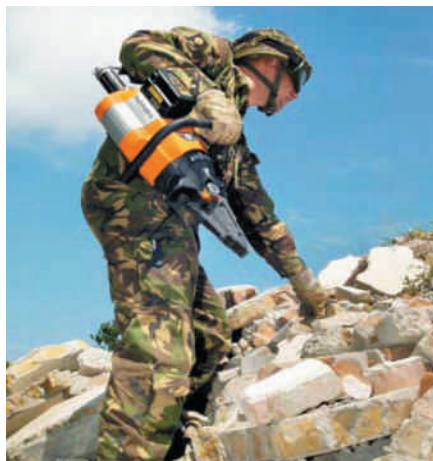
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## HOLMATRO RESCUE EQUIPMENT

Dutch-based manufacturer Holmatro Rescue Equipment is the world's leading supplier of high-pressure hydraulic rescue tools. With production facilities in The Netherlands and U.S.A. and dealers in more than 120 countries Holmatro provides a wide variety of extrication equipment to fire brigades, rescue teams, armies, navies, airforce and civil defence units all over the world. The Holmatro® Rescue programme includes hydraulic cutters, spreaders, com-



bitools, rams, door openers, (wedge) jacks, a shoring system, many accessories and assist tools, various pumps and a series of pneumatic lifting bags.

Being used for life saving operations rescue tools should function optimally in any situation. It goes without saying that good product quality and periodic maintenance are of vital importance. Furthermore, rescue tools should be able to offer solutions for the growing diversity and complexity of applications rescuers are confronted with nowadays. Being an extrication specialist Holmatro pre-eminently knows and understands the situations rescuers are faced with 'in the field'. The company gathers information on the latest (vehicle) extrication techniques and exchanges this knowledge with rescue training centres worldwide on a continuous basis. Thanks to close contacts with leading car manufacturers and the racing world Holmatro also stays in touch with the latest developments in vehicle constructions and materials. All of this enables Holmatro to design innovative rescue tools which are always one step ahead of the swift changes in rescue techniques and (new) car technologies: tools which perfectly match the many different situations rescuers come across in daily practice.

Through the years Holmatro has developed many innovative rescue tools. A number of quite recent examples include:

**New Car Technology (NCT™) cutters.** New car technologies – the application of harder materials and reinforced constructions in modern vehicles – better protect the lives of car passengers in the case of an accident, but at the same time make it much more difficult to free entrapped victims. A high theoretical cutting force does not automatically mean that a cut-

ter is suitable to cut modern vehicles. That is why Holmatro introduced a series of NCT™ cutters with special blades designed to deal with the new constructions and stronger materials as applied in the latest car models. These special blades offer better grip on the material and draw it into their central (i.e. strongest) cutting area where maximum performances can be achieved. As NCT™ cutters make use of their force effectively they have enough excess capacity left to cut future, even tougher, vehicle constructions.

**Portable pumps.** To improve a rescuer's mobility Holmatro developed a lightweight pump (only 15.5 kg) that can easily be carried to the extrication scene by one person, even when the location is far away or difficult to reach. This portable pump functions independently from the rescue vehicle and can power any type of hydraulic rescue tool. In 2003 Holmatro extended its portable pump concept with a lightweight duo pump for the simultaneous operation of any two types of rescue tools. Weighing less than 25 kg this lightest duo pump in the world enables one rescuer to carry it to the rescue scene. This also falls in line with the European Norm EN 1005 governing that one person is not allowed to carry loads over 25 kg.

**New generation of battery-powered rescue tools.** Ultimate mobility is offered by Holmatro's battery-powered cutters and combitools. With full preservation of force and performance these tools are truly cordless thanks to integrated advanced battery technology. Being self-contained, compact and extremely lightweight Holmatro's battery-powered rescue tools are designed for use in difficult to reach areas or confined spaces – e.g. in collapsed buildings or deep down a ravine – where a maximum freedom of movement is required. A weight of only





15 kg (including battery!) allows rescuers to easily carry these tools over long distances, even on rough terrain. The battery-powered cutters and combitools are not only suitable for urban search & rescue applications, but can also be used for victim extrication during rapid response operations following vehicle accidents.

**Shoring system with hydraulic struts for lifting power.** The PowerShore™ shoring system from Holmatro® consists of lightweight components in various sizes that can be coupled in a quick and easy manner. At the same time an automatic snap-lock system guarantees safe use. A unique feature of this system is that it includes struts with very powerful integrated hydraulic cylinders which cannot only hold the load, but also lift it to create potentially life-saving 'working space'. These hydraulic struts with 10 tonnes lifting capacity are available next to components with integrated pneumatics for the lifting of smaller loads and mechanical struts to just hold the load when creating additional space is not required. With the help of a swivel head the struts can be positioned under almost any angle. Holmatro's versatile PowerShore™ system is suitable for all sorts of shoring applications, ranging from vehicle stabilization to confined space rescue (manholes, collapsed buildings etc.).

Holmatro® rescue tools comply with all important national and international performance and safety standards such as the French NFS-61-571 norm, the German DIN 14751 norm, the European preliminary prEN 13204 norm and the American NFPA 1936 norm. Moreover, Holmatro was the first rescue tool brand to be certified by UL (Underwriters Laboratories) in the USA back in 1993. Today, many years later, Holmatro® is still the only brand that has been able to meet UL's stringent performance, testing and quality requirements. The Holmatro organization has the ISO 9001 certificate and works in accordance with the corresponding quality procedures.

*For more information, please contact:*

**Holmatro Rescue Equipment**

PO Box 33

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The Netherlands

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E-mail: [info@holmatro.com](mailto:info@holmatro.com)

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## LUKAS® LTR 3,5/820 EN TRIPLE TELESCOPIC RAM

### Still World's Only Triple Rescue Ram

The weight of the LTR 3,5/820 EN CENTury version has been reduced to less than 18 kg.

With its push capacity of 24 t in the first stage and 12 t in the second stage this ram is capable of carrying out even the heaviest rescue work.



Due to the telescopic design a stroke of 820 mm can be achieved while the retracted height is 480 mm only. This enormous working range allows to do rescue jobs in one step which would normally require the application of several traditional rams one after the other. Thus the duration of the extrication can be considerably reduced.

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The claw and the special designed foot of the cylinder are providing a firm grip even on flat or oblique surfaces.

The LTR 3,5/820 EN – excellent performance and technology for the future.

The rescue ram will be delivered with hydraulic oil and non-interchangeable quick-connect couplings.

### Technical data

total stroke		32.2 in
strokes:	piston 1	11.6 in
	piston 2	11 in
	piston 3	9.6 in
lifting forces:	piston 1	53,950 lbs
	piston 2	27,000 lbs
	piston 3	7,900 lbs
length:	extended	51.2 in
	retracted	18.9 in
dimensions	w x h	4.4 x 8.3 in
weight		38.6 lbs

Subject to revision

## LUKAS® CENTury TELESCOPIC SPREADER LSP 30 T

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The mobile spreader with telescopic arms is offering two features at a time: extremely high spreading force and extremely wide spreading distance. And that's new compared with traditional spreader designs: depending on the rescue situation it is up to the operator to

switch either to "maximum force" or to "maximum spreading".

### Recommended applications:

- Rescue operations in traffic accidents
- Rescue operations in buildings or after natural disasters
- Mobile rescue after a building collapse
- Confined space rescue e.g. in tunnels

### Highlights:

- innovative telescopic technology for maximum mobility and multifunction
- spreading force and spreading distance can be chosen according to the specific rescue scenario
- easy adjustment of the arm length
- low oil consumption – ideal for the combination with a mobile hydraulic pump (e.g. LUKAS CP 100)
- short opening and closing times
- only minimum storage space required
- maximum handling comfort through low weight, compact design and perfect balance
- precise operation with your fingertip in any working position



*(left) spreader with arms in home position, (right) spreader with extended arms*

### Technical data

Spreading force up to	292 kN / 65,650 lbs
Spreading distance (long arms) up to	625 mm / 24.6 in
Pulling force up to (short arms)	49,6 kN / 11,150 lbs
Pulling distance up to (long arms)	507 mm / 20 in
Weight	17,9 kg / 39.5 lbs

Subject to revision

*For more information, please contact:*

**LUKAS Hydraulik GmbH**

A Unit of IDEX Corporation

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E-mail: [info@lukas.de](mailto:info@lukas.de)

Website: [www.lukas.de](http://www.lukas.de)

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The Ogura range of battery-powered hydraulic rescue tools fill the gap left by the more traditional heavy-duty tools that, because of weight, access and other limitations, are not suitable for every situation.

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There is no set-up time so the tools are ready for immediate deployment. And once in operation there are no trailing hoses or cables to get in the way or to limit the freedom of movement.

The battery that powers these fully hydraulic tool clips into base of the pistol grip style handle where it is easily removed for charging or changing. Battery maintenance is made easy by the Ni-MH batteries that have no memory so can be charged in any state and the "intelligent battery charger" that makes sure that they are never over charged.

The year 2003 has seen continuing improvement and additions to the Ogura product range with the introduction of the HRS-92 Rescue System and the BC-250 Combination Tool.

The HRS-92 is an improved version of HRS-91. The weight of the tool heads and pump unit has been reduced and the tool heads now offer the choice of either direct connection to the pump unit or via an extension hose. In the pipeline are additional tool heads, and a special sleeve that when fitted to the pump unit will allow underwater operation up to a depth of 10 m.



The BC-250 Combination Tool at 13.5 kg (including battery) is the lightest tool in its class and, with a Cutting Force of 27 t and Spreading Force of 10.6 t, one of the most powerful.

All the tools come in their own carrying cases with battery, battery charger, tools and manuals.

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Kanagawa Pref 243-0417  
Japan  
Tel: +81 46 238 1285  
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## WEBER-HYDRAULIK KEEP THE "PRESSURE ON" WITH NEW HIGH PERFORMANCE TOOLS

Following on from the success of the large supply contract for the Scottish Executive "New Dimension", Scotland, Weber-Hydraulik have developed a new generation of rescue tools in preparation for the demanding requirements ahead.

These latest additions to the already comprehensive range offer the ultimate in power and performance, yet maintaining Weber's low weight, and perfect balance.

The new ultra performance S 270-71 Cutter is one of the world's strongest, supplying up to 71 tonnes cutting force, and with a huge opening of 270 mm yet, some how, still weighing only 17.4 kg.



With the new SP 60 Spreader, Weber have achieved extreme spreading force of over 25 tonnes, combined with the largest of spreading distance, whilst still being under 25 kg.

You do not usually associate combination tools with heavy rescue work, but Weber has set new standards with the new SPS 400 Super Combination Tool. Where customers simply do not have the space, or the budget for two dedicated tools, then this new combination tool has the performance to tackle the toughest of commercial rescue work with a cutting force of over 50 tonnes, and over 70 tonnes spreading force. In addition to these benefits, the working tips of the blades/arms can be quickly removed to enable unrestricted and unhindered cutting.

Liaising closely with Europe's leading car manufacturers, and relentless testing on the latest material sections, and safety systems fitted within new automobile construction, Weber-Hydraulik ensures its tools are ahead of the game.

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## ZUMRO RESQ Q-CUTTER



Confined space rescue is not only a specialized piece of action, a very small cutter is a first requirement as well as a rescuer mostly needs to cut material from spaces as large as the fist. Therefore Zumro has introduced the Q-Cutter; a very small and light weight cutter with a semi-remote thumb-control and a head which articulates 180 degrees. This Q-Cutter therefore is the ideal solution for cutting seat frames and pedals!

This compact cutter has a minimum cutting force of 149 kN and can cut 18mm round hot steel bars as well as a flat bar of 50 x 6mm. Moreover the Q-Cutter has a minimum spreading force of 36 kN (3 ton) with only a weight of 7.4 kg.

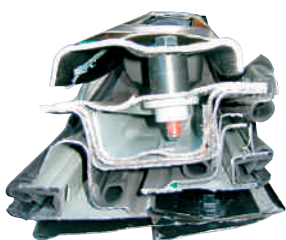


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# MELBA INDUSTRIES

## Innovation and Service

The Australian textile market has diminished greatly over the past 10 years. Once a significant employer, textile manufacture is now regarded as an endangered species. As with other developed markets in the world, it has been extremely difficult to maintain a viable local operation when your client base moves purchasing off-shore. This has resulted in a massive reduction in the number of textile companies operating in Australia.

Melba Industries has operated in Melbourne, Australia since 1934. Once dedicated to the manufacture of apparel fabrics, this privately owned company knew that product innovation and specialised market development was vital to the future of the business. Melba has been one of the success stories of the Australian marketplace. It is the country's leading manufacturer of automotive, technical and seating fabrics. This process of change has seen the company become the first textile manufacturer in Australia to be awarded the automotive quality standard QS 9000 and conforms to ISO 9001.

A major reason for this success has been the development of a range of technical textiles, both woven and knitted, designed to offer a specific level of performance. These textiles are utilised by a variety of markets – military, fire services, police, mining, filtration, safety and medical.

An important point of focus for the company has been the development of the fire service and military markets. The Australian marketplace is sophisticated and both Australian and international standards are utilised to ensure the safety and protection of the worker. Leading personnel in the fire services and military sectors have an intimate knowledge of these standards. The key is for them to determine the level of protection required and what products

would best suit their needs.

Melba Industries has designed a range of products that reflect these needs yet also honour the difficulties of the Australian climate. The aim of Melba's technical development team has been to design the lightest, most breathable 'fit for purpose' systems the market can offer. They work closely with the relevant authorities to clearly identify the appropriate level of protection they require and then manufacture a range of products to reflect these needs.

Melba Industries manufactures a range of protective fabrics from Nomex 111A, Nomex Delta C, various Nomex blends through to PBI Gold. The emphasis is always on product weight and suitability. Australia can get extremely hot and humid. Incorrect attire can incapacitate a person very quickly. It is no use wearing a system that may offer tremendous heat protection yet results in heat stress to the wearer.

With this in mind the Australian Standard AS 4967(Int)-2002 – 'Protective Clothing for Fire Fighters' was devised. This standard reflects the varying needs of the Australian fire fighter and allows each individual state agency to determine the level of protection required by the members. For instance, the Australian Standard AS 4967(Int)-2002 has two performance levels in each test of thermal performance test – Heat Transfer (Flame) EN367 and Heat Transfer (Radiation) EN366. This dual system allows for each agency to accurately nominate their required level of performance for their turnout system and yet be fully accredited to the Australian Standard. The needs of a fire fighter in Southern Australia in regard to clothing will vary from a fire fighter in Northern Australia. This standard allows for such differences. Already the market has witnessed certain agencies

deciding not to include a membrane in their turnout system whilst others maintain the need for such membranes.

Melba Industries has worked closely with the Australian marketplace to design a multitude of systems to reflect differing needs. Melba not only offers the latest technology in their outer shells for the turnout coats but also has developed an extensive array of membranes and thermal layers. Whilst the main focus has been adherence to the Australian Standard AS 4967(Int)-2002 they have also designed systems to meet the requirements of the European Standard EN469 and United States approach of NFPA-1971.

Melba Industries has been able to approach the Australian marketplace in an innovative manner to ensure the systems they supply suit the individual requirements of the fire service agencies. The same approach has also enabled them to export their fabric combinations to a variety of countries in the Asia Pacific region. The problems associated with heat stress for the fire fighter is a world-wide issue. Melba's innovative fabric systems can be utilised by any fire service where garment weight and breathability are a concern. Combined with a focus on customer service and technical support Melba has been able to solve the 'problems' of many a client.

For more information,  
please contact:

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# Vigorous decon equipment maintenance programmes

By Mark Whitcher,  
Managing Director,  
Professional Protection  
Systems Ltd.

*Pic courtesy of PPS*

## AN ESSENTIAL PART OF HOMELAND DEFENCE

CURRENTLY, A GREAT DEAL of money is being invested by governments and other institutions throughout the world in terrorist response capability. A not insignificant slice of this money is going on the purchase of decontamination technology. For this investment to be effective it is axiomatic that emergency services personnel have to know how to use the equipment and how to maintain it.

**M**aintenance in particular is an issue because decon technology is essentially about a defensive technology that in most cases will never have to be used, save of course for the smaller purpose built units deployed at events like hazmat incidents. Because of this there will always be an understandable tendency for hard-pressed and over-stretched emergency service personnel to marginalize the need for regular checks on the incident-readiness of equipment in this category, especially when they have so much else that seems to be more immediate, if not more important, on their plates.

These checks can be likened to lifeboat drills and maintenance. The fact that the ship will probably never

sink doesn't mean that there is no need for regular checks and maintenance to ensure that the boats can be launched if necessary. It is a programme essentially applicable to most decon units to

be found in service anywhere in the world. It addresses maintenance in depth, putting the smallest details under the microscope whilst also offering depth in terms of time.

This maintenance programme is based on a five-year life span for inflatable units and 10 years for mechanical units. In fact applying this kind of programme will prolong the life of either type of unit considerably beyond those periods, but technologies are changing rapidly and units now in



*Pic courtesy of PPS*



# Vigorous decon equipment maintenance programmes

service will probably be obsolescent in a decade.

Any viable maintenance programme depends on a close co-operation between manufacturer and user. Practically this means the end user has to be offered some insight into the manufacture of the product, as well as hands-on experience of the equipment in its pre-delivery state. The aim is to develop familiarity with the product in a hands-on way. This is of course not a substitute for operational training exercises, rather it is the up-stream part of these, where the user can learn to deploy the units with the maximum of technical accuracy. It is only when operatives are



Pic courtesy of PPS

familiar with the possibilities of decon equipment that they can carry out the maintenance checks. In practice these are slightly different for inflatable units and the new big mechanical homeland defence mass decon units. For either to function however close attention has to be paid to the accessories which both types of decon shower enjoy in common. Water and air heaters, generators, pumps and even non-mechanical items like raised flooring, waste water tanks, couplings and hoses, if they are not constantly monitored, may have an effect on the inherent operational liability of the equipment.

As far as mechanical equipment is concerned procedures must be provided for inspecting all units for signs of wear or damage. Also it provides for regular checks on items like oil levels, signs of fuel contamination, the state of electrical cables and connections as

well as regular inspection of water connections and fuel lines for wear or damage. An important part of the procedure is to start up all units and confirm that they are operational within their specified limits. Lastly, and most importantly, a worthwhile maintenance programme must instruct, after cleaning and testing and the fastening of appropriate test labels, how equipment should be packed away in such a manner that it could spring into instant life.

Inflatable units have their own special procedures. All equipment appertaining to them needs first to be checked against the inventory list then the unit has to be inflated and monitored out for obvious leaks. Particular attention must be paid to welded seams and the containment, doors and zips have also to be examined for damage or wear.

Features like loops, light port holes, groundsheets, water sumps and curtains must also be inspected for damage or wear. Water systems have to be subjected to similar procedures. Features like detergent injection systems have to be inspected for blockages or signs of damage.

The structures of the second-generation Mass Decon units, because they are mechanical and work on an articulated frame technology, are subject to different maintenance issues. They have an immediate advantage over the first generation products as absolutely no air whatsoever is involved when they are deployed. The strength of the inflatable, still the numero uno for

*Water and air heaters, generators, pumps and even non-mechanical items like raised flooring, waste water tanks, couplings and hoses, if they are not constantly monitored, may have an effect on the inherent operational liability of the equipment.*



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# Vigorous decon equipment maintenance programmes

smaller scale situations, resides in the fact that it can usually be rapidly and relatively easily repaired and made ready for action again. Whilst a second-generation unit is unlikely to present any serious maintenance issues any problem with the mechanical structure is going to need a professional

*It will be clear from this that the decontamination unit has evolved rapidly into an infinitely more complex piece of technology than the original units first introduced in 1996.*

engineer to fix it. The solution to this is that as soon as the problem is located the defective unit is removed for repair and a substitute put in its place. These new units, capable of handling 200 ambulant and 20 plus non-ambulant casualties per hour are becoming flagship units of the emergency services. Their metal frames are of enormous complexity and if they do require attention it has to be from a dedicated frame specialist. Fortunately because of the fine tolerances to which they are made and the aircraft grade aluminium from which they are manufactured this is an unlikely event. Also they are so designed that they can remain in action even if 30% of the frame is damaged. It is essential however that even when held in store these units should be

erected from time to time and rigorously examined for any faults.

It will be clear from this that the decontamination unit has evolved rapidly into an infinitely more complex piece of technology than the original units first introduced in 1996. For this reason the future is going to mean manufacturers working ever closer with end users. Also those manufacturers are going to have to be outfits with an international reach able to offer complex services as a matter of course. This means the day of the cottage-industry supplier has finally gone.

Besides the end user coming to the manufacturing unit this new dispensation will involve the manufacturer in carrying out annual site inspections. This will be backed up by an access controlled website containing downloadable instructions for all products plus advice on fault tracing. A 24-hour telephone hot line for advice will also be part of the package plus a round the clock-call out service.

Currently we are working on ratcheting up this level of service by the introduction of an on-going Decon Users Forum. This will enable end users to feed back information on all aspects of equipment use and performance. This in turn gives the manufacturer the possibility to continually fine tune products and thus deliver ever-improving performance to our customers, the people at the sharp end. I hope this proves that the need for a well thought out maintenance programme for decon equipment is a very real and valid one that is going to be at the heart of the best decon manufacturers' relationships with their customers.



Pic courtesy of PPS



## KME FIRE APPARATUS

**K**ME Fire Apparatus is an industry leading, custom manufacturer of a full range of apparatus. The Company began in 1946 and today has grown into the third largest U.S. supplier of fire apparatus. KME's niche in the market place is building truly custom apparatus designed for the unique needs of each fire department.

Fire Departments worldwide have relied on KME to provide them with quality apparatus. Units are currently in service throughout the United States, Canada, Mexico, Central America, Eastern Europe, Egypt, Turkey, South

Africa, and China. KME has departments dedicated to both domestic and international business capable of meeting the needs of a variety of different standards.

KME's product line is quite diverse and includes hundreds of configurations available on either a commercial chassis or one of KME's 300 different custom chassis models. For over a decade, KME has been manufacturing Airport Rescue Fire Fighting (ARFF) vehicles and Rapid Intervention Vehicles (RIV) for airport firefighting. The KME Aerial line is the broadest

family in the fire service including rearmount, midmount, and tractor drawn aerials from 55' to 121'. And KME is the only manufacturer in the world to perform both UL and Proof Load Testing on its aerials. KME has long been recognized as a leader in the manufacture of pumpers and tankers. Styles include skid units, mini-pumpers, Class A pumpers, foam pumpers, industrial trucks, t-tankers, and elliptical tankers. No manufacturer offers as many plumbing, compartment, and body style options as KME.

KME offers over 75 different rescue configurations in aluminum and stainless steel for every function including incident command, hazmat, rehab, air/light, paramedic, and confined space. Whatever the apparatus or options, all KME's have reliability and quality built in from the start.

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# What Personal Protective Equipment?

By Nick Lacey

IT SEEMS A LIFETIME AGO since I struggled through the teeming mass of eagerly expectant taxi drivers, which were forming the running gauntlet from *Tat Son Nhat International Airport, Vietnam*.

I had finally arrived after my epic journey, jet lagged, bleary eyed and dishelved, only to be met by a torrential downpour. "Good Morning Vietnam"! But where's the sun? I had imagined to be met with the warm embracing tropical breeze of this far-flung country, not raindrops the size of golf balls leaping two feet into the air off the steaming tarmac. The whole scenario could not have been further from my imagination.

The date was the 20th August 1998, and I was about to get my first taste of the Vietnamese 'Safety culture'!

I had to travel the two and a half hour journey by road from Ho Chi Minh City to the southern most point of Vietnam, a place called Vung Tau, which was to be the departure point to my new home for the next six weeks offshore. This was a Floating Production Storage and Offload facility, better known to those in the business as a FPSO (Pronounced Fipso). I was to find myself forty minutes by Helicopter offshore of South Vietnam. I still had my journey by road to overcome first, and boy what an eye opener!

Teams of local roadwork 'Specialists,' were busy repairing some of the many potholes to be found en route. Some of these were over eighteen inches in depth! These workers were dressed in all their best Personal Protective Equipment (PPE). This consisted of vest, shorts and well worn "safety boots". Better known to Expats as flip-flops. One worker was operating a pneumatic drill, breaking up huge heavy chunks of tarmac whilst his colleagues were

removing them, also attired in their 'flip-flop safety boots.' What PPE? Was this the standard of safety I was to expect? Surely these workers were a one off; these guys cannot be for real; could they?

I was then treated to a spectacular show of balancing skills, which the Moscow traveling circus would be proud to possess and all whilst riding on a moped, as along with bicycles, this is the favored form of transport in Vietnam and much of South East Asia. Of course the whole operation is carried out, minus any head protection, leathers or protective clothing we are accustomed to, and of course wearing the standard 'safety flip-flops.' I watched amazed as two men carried a plate glass window, lodged between them on a clapped out rusty moped. Then a man with an arm chair, part of a three piece suite, which was strapped to his back with the sheer weight forcing his bony chin onto the handlebars of the rickety rusty bike. Then to cap it all, a smiling family of six, complete with babe in arms and of course well-worn, designer 'Safety Flops'. I never did get to see a party of seven! Just

what have I let myself in for? Surely the locally employed work force offshore would be more safety conscious than this? Surely those guys offshore will be totally different?

Looking back over the last 30 years, I have learned an awful lot about Safety in general, and the various types of PPE available.

Safety cultures differ dramatically throughout the countries of the world. Having worked in many areas of the globe and currently in West Africa, it is clearly apparent that International standards and stringent regulations for the wearing and use of PPE are not only totally disregarded, but also completely unheard of!

## SO WHAT EXACTLY IS P.P.E.?

It's a last line of protection, the very last resort. The book definition of PPE is; 'Any device or appliance designed to be worn or held by an individual at work for protection against one or more health and safety hazards'.

PPE *really* is the last line of defense. The majority of employers know that PPE, if worn correctly, can protect employees from the risk of injury by creating a barrier against workplace hazards. It is not a substitute for sound engineering controls and documented workplace procedures. It should be worn and used in conjunction with these controls, if there is no other way to protect the worker. We cannot protect the workforce purely by providing them with various items of PPE.

Which item should they choose? How should it be worn? Does it afford





## What Personal Protective Equipment?

suitable protection for the task in hand? Far too many employers still believe *“it is someone else’s problem”* and *“It is not my fault if the employees do not wear it, at least we provide it.”*

I recently attended a safety seminar in Singapore, whilst assigned to a new FPSO conversion. During the course of the seminar, it came to light that a fatality had occurred in the offshore industry to an employee who was actually in the process of putting on an item of PPE. Inconceivable; yet nevertheless true. The protective item happened to be a safety harness, and the unfortunate individual was in the process of donning the harness whilst walking between rotating equipment. The harness became entangled in the equipment and pulled the unsuspecting individual into the rotating component, resulting in fatality.

Many smaller incidents involving PPE spring to mind. For instance a young Vietnamese welder sustaining a superficial burn on the back of his wrist, the size of a watch face, as a result of a

hot piece of welding slag dropping inside his gloves. Was it incorrect PPE for the job? Was he even aware that he had the wrong gloves on for the task he was undertaking? He *should* have been wearing correct welding gauntlets, but who should provide this equipment? Who was responsible for training him? Who was his direct line Supervisor?

### SO WHAT ARE THE GUIDELINES?

It’s not enough to merely provide PPE and expect employees to know how it is worn correctly. Management are accountable and directly responsible for ensuring a duty of care to their employees. The bad old days of “But we’ve done it like this for years!” are now thankfully gone. The PPE at work regulations 1992 often referred to as part of the “Six pack” clearly place a duty of care on employers and the self-employed to provide serviceable and suitable PPE, at no cost to their employees. One only has to pick up the daily papers to see that today companies are heavily fined if a breach of these regulations take place and this can also rise to civil claims against the employer.

The Personnel Protective Equipment at Work Regulations 1992, clearly outline these requirements. A new regulation has recently been included to place a duty on all suppliers to supply safe PPE. Contravention of this requirement is now an offence under the consolidated regulations and extends to the retailers and the suppliers of PPE. The design of equipment and clothing must be of a safe design and construction for the work to be performed and easily maintainable. Various regulations

concerning PPE maybe country specific to the region you are working in, so it is worth ensuring that the regulations you are following are applicable to the country in which you are working.

So what exactly are the responsibilities towards PPE?

### RESPONSIBILITIES

**Employers** – They have primary responsibility for the implementation of the PPE Program in their work place. This includes:

- Conducting workplace Risk Assessments or Job Safety Analysis (JSA’s) to determine the presence of hazards, which necessitate the use of PPE.
- Conducting periodic workplace inspections and reassessments of hazards.
- Maintaining documented records on all hazard assessments.
- Providing training and technical assistance to Supervisors on the proper use, care and cleaning of approved PPE.
- Providing guidance to the purchaser or Supervisor for the correct selection and purchase of approved PPE.
- Periodically reevaluating the suitability of previously selected PPE.
- Reviewing, updating and evaluating the overall effectiveness of the company PPE program.

**Supervisors** – Have the responsibility for the implementation of the PPE Program in their designated work areas. This includes:

- Providing appropriate PPE and making it available to their employees.
- Ensuring employees are trained on the proper use, care, and cleaning of PPE.
- Maintaining records on PPE instruction and training.
- Supervising their staff to ensure that the elements of the PPE program are followed and that employees properly use and care for their PPE.
- Notifying the authorities when new hazards are introduced or when processes are changed or added.
- Ensuring defective or damaged equipment is immediately replaced.

*The PPE at work regulations 1992 often referred to as part of the “Six pack” clearly place a duty of care on employers and the self-employed to provide serviceable and suitable PPE, at no cost to their employees.*



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# What Personal Protective Equipment?

**Employees** – They also have responsibility for:

- Following the requirements of the company PPE program.
- Always wearing PPE as required.
- Attending required training sessions.
- Caring for, cleaning and maintaining PPE.
- Informing the Direct line Supervisor of the need to repair or replace damaged or defective items of PPE.

## TRAINING

Careful consideration should be given to the comfort and correct fit of PPE in order to ensure that it will be used. Protective devices are usually available in a variety of sizes, so care should be taken to ensure that the right size is readily available and selected for use. Any employee required to wear PPE shall receive training in the proper use and care of PPE. This also includes the direct line Supervisors. Training should include, but not necessarily be limited to:

- When PPE should be worn.
- What PPE is necessary for the particular hazards in the workplace.
- How to correctly don, adjust and wear the PPE.
- The limitations of the PPE.
- The proper care, maintenance and useful life expectancy.

After training the employees shall demonstrate that they understand, the components of the company PPE program and that they know how to use the PPE properly. Written records are essential and should include the type

of training provided, names of all persons trained and the dates the training occurred. These records should be kept for at least 3 years.

## PEER PRESSURE VERSUS OPEN SHOP?

A problem still exists in many companies, especially in third world locations using National staff, when individuals require PPE replacement or even initial issue. Employees are often reluctant to approach their Supervisors or managers to replace defective items of clothing or equipment. In order to prevent high consumption, and the associated expense to maintain stocks of replacement PPE, a fine line needs to be drawn between an “open shop” policy and the ‘third degree’ in-depth scrutiny as to why the individual wants the PPE replaced, without deterring them from asking for replacement.

It is common in these situations for many companies to operate an open, no questions asked, “hand in” replacement program after initial issue. This allows better controls to be kept on the consumption/cost of the PPE, the defective or old PPE can be disposed of correctly, and additionally as the used or worn out equipment is collected it can help with the analysis of how certain types/models of PPE are actually withstanding the application duties in the workplace.

## RIGHT KIT FOR THE RIGHT JOB?

So how do we know that we have the right PPE for the task in hand?

Although PPE may be provided, it is essential that the Supervisor or person responsible for issuing the equipment is aware of its limitations. As an example there are numerous types of gloves available in today’s market, but are the right type chosen for the correct task in hand? One type of glove will not work in all situations. Gloves that can protect against chemicals may afford little protection against abrasions, cuts, lacerations or punctures or harmful temperature extremes. Fire suit gloves that are used in a domestic capacity might not afford suitable protection for crash rescue purposes?

Many years ago in the mid seventies, during a training exercise, a colleague of mine was burnt quite severely on both hands during a drill. The gloves

he was wearing gave very little protection for the situation he was faced with. He was caught in a flash back resulting in burns to both hands.

So careful consideration is essential in ensuring the right PPE is selected for the task in hand. Consideration should also be given to the comfort and fit of PPE in order to ensure that it will be used. Protective devices are generally available in a variety of sizes, so care should be taken to ensure that the right size is selected.

If a Fireman is employed in a domestic role and is then switched to airport duties, does he need to also switch to a close proximity suit? The answer of course comes back to sound management, documented procedures and good supervision backed up by methodical training methods.



## THE AUTHOR

Nick Lacey has over 30 years experience in fire fighting, fire prevention and aircraft crash rescue procedures, having served in the Royal Navy’s Fleet Air Arm for 23 years as an Aircraft Handler. During this time Nick was employed on Aircraft Carrier flight decks and shore side in the Naval Air Command Fire Service, where he finished his career as Fire Chief. On leaving the service, Nick moved into a Health and Safety role having studied the NEBOSH general Certificate in Health and Safety and attended numerous courses for the offshore industry.

Nick is currently employed as Safety Officer onboard a FPSO producing over 110,000 barrels of oil per day. He is responsible for all aspects of safety and training onboard and is also the Helicopter Landing Officer (HLO).



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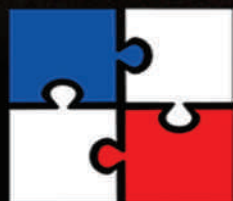


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# Thermal Imaging

By Nicky Probyn

## Two Decades of Product Developments

*e2v technologies first thermal imaging camera – the NFTI (Naval firefighters thermal imager) used by Naval firefighters*

MONITORING THE TEMPERATURE of objects has long played a role in everyday life. As early as 400 BC, Hippocrates (the Greek Physician) wrote: “In whatever part of the body excess heat or cold is felt, the disease is there to be discovered.” Finding its origins in medical applications, thermal imaging – the ability to detect heat, not light – has become an important part of civilisation. Firefighters use thermal imaging cameras to locate the source and spread of a fire and for search and rescue operations, thermography plays an important part in engineering maintenance and doctors use the technology as a non-invasive method of mapping body temperature. But where does it come from? And where is it going?

In the early 19th Century, the astronomer Sir William Herschel tried to map heat given off by separate colours of the rainbow spectrum projected onto a table in a darkened room. The highest temperature, he found, was beyond the red end of the band. This heat he called “dark heat” and it was Sir John Herschel – Sir William’s son – that later recorded rays of dark heat – terming the image a “thermogram”. This early research laid the foundations for advances that would come over a century later, with more sophisticated thermal imaging devices, then used in

military applications.<sup>1</sup>

Initial military thermal imagers – used in the mid 20th Century – had been the preserve of high-end programs. Devices used were heavy and inflexible – designed to be fixed to vehicles, aircrafts and ships, utilising detectors that had to be cooled down to very low temperatures to demonstrate optimum performance. In addition, military thermal imagers were extremely expensive, too expensive to be used anywhere but in funded government programs.

The advent of thermal imaging for fire services came in the 1970’s, when a UK Government Central Fire Brigade

Advisory Council submitted a report on assisting the vision of firefighters in smoke. The report examined technologies that could be used to aid the location of casualties and the seat of a fire in thick smoke. The report correctly identified that long wavelength infrared radiation was almost unaffected by all classes of smoke. It was found that a suitable thermal imaging camera would be able to “see through” smoke almost as if it wasn’t there. The solution found, the only problem now lay in finding a device that was not only smaller and more flexible than current technology options, but also far less expensive.

Enter the “pyro-electric vidicon” (Pevicon™ trademarked by e2v technologies, then EEV). Pevicon™ based thermal imagers were originally designed for military applications, but had never reached the required performance. Pevicon™ tubes were, however, both relatively cheap to produce and, more importantly did not require cooling to operate. In the 1970’s, at the time of the report, only a small number of Pevicons™ were being produced annually and supplied to academic and research bodies. Following the

<sup>1</sup>Source: <http://www.thermology.com/history.htm>





e2v technologies latest thermal imaging camera

publication of the research report and recognising a market for its technology, e2v technologies set about developing a thermal imaging camera based on the Pevicon™ and successfully trialled it with a small number of UK fire brigades. The camera satisfied all brigade requirements but, due to the relative lack of knowledge of thermal imaging at the time, the cameras were seen as something of a novelty, rather than the essential firefighting and rescue tool they were set to become.

#### CHANGING PERCEPTIONS

In 1982, the UK became involved in the Falklands conflict. Around 250 British and 750 Argentinean lives were lost<sup>2</sup> –

2 Source: [http://www.bbc.co.uk/history/timelines/britain/post\\_falklands.htm](http://www.bbc.co.uk/history/timelines/britain/post_falklands.htm)

most of them at sea. Images of Royal Navy ships with thick smoke billowing from them were broadcast around the globe. A shipboard fire is a catastrophe for passengers and crew. Multiple sealed compartments can fill with smoke, making navigation through the vessel a slow process and impeding efforts of onboard fire and rescue teams to locate and extinguish the seats of fires – using time that isn't available. There is little chance of escape from a shipboard fire and very little opportunity for the fire to burn itself out. More and more vessels were stricken with fire and it was this urgent operational requirement that led the Royal Navy to deploy the first thermal imaging cameras into its fleet. Thermal imagers subsequently rapidly became an invaluable tool, helping to reduce losses due to fire both in peacetime and battle situations. The trend set, many more European and Commonwealth Navies followed suit, and following serious damage sustained by the USS Stark in a Gulf incident, even the US Navy and coastguard made Pevicon™ based thermal imaging cameras standard damage control equipment throughout the fleet.

At last thermal imaging had started to become standard fire and rescue equipment – for military applications at least.

#### TECHNOLOGY DEVELOPMENT

Thermal imaging cameras now having become commercially available, technology had to develop in line with end-user requirements. In the mid 1990s, an initiative funded by the US government aimed at producing lower cost and more flexible thermal imaging systems for the military resulted in the production of a Focal Plane Array detector. Although driven by military needs, this program was funded on the “dual use” principle, meaning that



e2v technologies first thermal imaging camera for civilian fire brigades

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usage for the detectors was envisaged both for military and civilian firefighting applications.

This new detector type not only enabled output of far clearer pictures than was possible with vacuum tube technology, it also opened the market to competition. Today, thermal imaging cameras for firefighting purposes are manufactured and offered by a variety of different companies – principally from the US, UK and France. Due to the new detector type having been developed for military applications in the US, the sensors were heavily export license restricted, meaning they could only be sold to certain countries worldwide.

Increased competition and volumes have also meant that the price of cameras has fallen substantially in real terms. This has resulted in ever increasing use of the technology worldwide. Coupled with the advent of microbolometer sensors that deliver ever better image quality, the global marketplace is becoming increasingly competitive. Vast improvements in electronics within thermal imaging cameras allow manufacturers to offer many additional



*Image captured with the Argus®<sup>3</sup> in a fire scene*

features, enabling them to become a more flexible and useful tool. Today, remote video transmission, temperature measurement and digital zoom are common offerings.

#### BUT WHAT OF THE FUTURE?

As with consumer electronics, the pace of development in firefighting thermal imagers seems to get faster and faster. In addition to firefighting, worldwide applications for thermal imaging cameras are ever increasing. Today, thermal imagers are used in other markets, not only for search and rescue operations but also as preventative maintenance and condition monitoring tools, and

other industries are fast recognising the benefits of non-contact monitoring of heat – or cold. Buildings maintenance can be carried out, monitoring heat loss from windows or the run of electrical cables in walls. This overall market expansion is funding more and more detector and electronics developments and could see thermal imagers become increasingly more versatile over the coming years.

Whilst firefighting will always remain a difficult and dangerous job it is evident that thermal imaging is one of the most significant developments in aiding firefighters and search & rescue teams since the advent of breathing apparatus. With more versatile cameras available, there is a real possibility that cameras could be small and light enough to be integrated into one system – using a firefighters breathing apparatus as a backbone and integrating all components of firefighting: vision, air, communications and hazardous gas warnings. With this fully integrated system available to all firefighters wearing breathing apparatus, thermal imaging will have fully realised its potential – enabling smoke to become as normal as daylight vision.

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# THERMAL IMAGING ROUND UP

## BULLARD THERMAL IMAGER PRODUCT LINE OVERVIEW



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With the same tried-and-true simplicity and durability of the original T3, the Bullard T3LT incorporates an upgraded Raytheon Amorphous Silicon engine for improved image clarity and picture definition. The T3LT also incorporates a Relative Heat Indicator (RHI) feature to provide on-screen temperature measurement.

The Bullard T3MAX offers the same design features as the T3LT and provides customers with the clearest possible picture and crystal-clear fire scene imagery. The ultra-high performance BAE Systems Vanadium Oxide microbolometer engine provides heat indication features such as an advanced Relative Heat Indicator (RHI™) for on-screen temperature measurement and a Red-Hot™ feature that colorizes high heat objects.

*For further information, please contact:*

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60°C for one hour, with higher temperatures being tolerated for shorter periods.

Additionally, the Argus®3 boasts an infrared remote control and PC software, allowing end users to configure the camera to their specific needs;

no other control or adjustment equipment is required. A brigade's own logo can be uploaded onto the Argus®3 splash screen, enabling improved asset tracking; the time and date can be set and colour options can be selected prior to entering a fire scene. Once all settings have been chosen, simple button operation allows the user to switch the camera on and off, take pictures, activate the digital zoom facility and remote telemetry (if included). Ambient temperature measurement as standard on all camera models (with spot temperature an optional feature) allows accurate reading of surrounding conditions.

*For further information, please contact:*

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Waterhouse Lane,  
Chelmsford, Essex  
CM2 2QU England  
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## FLIR SYSTEMS' FIREFLIR 131

The FireFLIR 131 is a remarkable thermal imaging camera featuring a high definition VOx Microbolometer detector, advanced software features, glove-friendly push-button controls, and the largest display screen in the market. The FireFLIR 131 is lightweight and well balanced, it supports 300 pounds for crawling and is the most durable handheld available.

The FireFLIR 131's customized MicroIR microbolometer detector provides unsurpassed thermal imaging quality with exceptional resolution, fastest update rate, and widest dynamic range in the firefighting industry. Additionally, the

FireFLIR 131 includes thru-the-lens digital temperature measurement, exclusive color palettes, and features InfoTherm™, an exciting feature that enhances situational awareness by applying a

color palette to temperatures around the combustion point of paper and wood products.

The FireFLIR 131 is ergonomically sound; when held at waist level it reduces shoulder muscle strain and fatigue, and the camera is never positioned in front of the eyes so it does not block the user's normal field of vision.

*For more information, please contact:*

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The breakthrough with the Evolution 5000 came from its use of an Indigo Systems sensor that delivers high-performance image quality and exclusive thermal imaging features – such as Quick Temp® and Heat Seeker®.

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**B**ronto Skylift is proud to present a new member of the popular range of rescue ladders: Bronto Skylift F 38 RL. The unit has a working height of 38 meter. With a transportation height of 3.3 – 3.7 m (depending naturally on the chassis) the unit is still very compact and easy to use even in the city.

The main operating data:

Max. working height (depending on transportation height)	38 m
Max. height to working cage bottom (depending on transportation height)	35.8 m
Max. height to the top of the ladder (depending on transportation height)	36.8 m
Max. working outreach	21.6 m
Max. working reach below the ground level	5.0 m

Safe working load (without water discharge)	400 kg
Max. nominal water discharge capacity (with adequate supply pressure)	3800 l/min
Rotation, continuous	360°
Transport height (depending on chassis)	3.3 – 3.7m
Transport length (depending on chassis)	10 m
Transport width	2.5 m
Typical weight with chassis, G.V.W. (standard specification)	26.0 t

The F 38 RL has two booms, the first boom with telescopic extension providing direct movement and the second boom with vertical movement of approx. 180 degrees. This configuration results in compact travelling dimensions yet in extreme versatility in operation. The

second boom provides an up-and-over capability of approx. 7.8 m through-out its vertical movement. The boom design permits the cage to be positioned up to 5 m below ground level – this provides additional flexibility for rescues from rivers, embankments, canals, docksides etc.

The RL range covers now the working heights from 23 to 53 meters. These aerial ladder platforms combine the benefits of a conventional ladder and a platform. All Bronto Skylift RL units are more versatile than conventional ladders; they can be used for continuous rescuing, there is a ready-to-be-used water line in it for fire fighting, the rescue cage can be equipped with fixed tools (for instance flood lights, stretcher carrier, cutting extinguisher etc.). The unit is ready for action once levelled, compared to ladders, where the equipment needs to be dragged up before taking into use. The Rescue Lift cage can also be used without manpower in the cage which is not possible with ladders. The dimensions of the capacious rescue cage are 1.0 m (length) x 2.0 m (width) x 1.1 m (height). The cage is fitted with an inward opening door located at the rear left side to enable safe access to the cage in travelling position.

Fast positioning and computer aided operations increase passive safety of the firemen in extreme situations. All RL units have Bronto+electronic system. With the B+ system the cage load can be selected as per desired outreach and outrigger positioning. Or by choosing the cage load the systems shows the maximum outreaches to all working sectors. The unit's stabilizing system is automatic "one button" variable jacking type. This feature substantially reduces the width required for setting up and operating the aerial yet it provides full working height and working outreach depending on where the jacks has been placed. There are two independent automatically operating and self controlling safety systems to prevent an unsafe configuration.

The first F 38 RL unit was delivered to Mikkeli Fire Brigade (situated in Eastern Finland) in the end of 2003. The unit is mounted onto Mercedes Benz Econic 2628 NLA chassis.

For further information, please contact:

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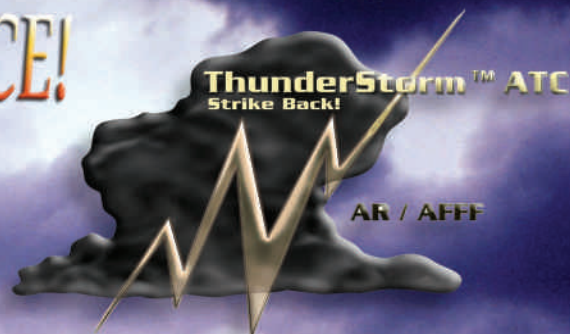
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# Are “environment friendly” foams really green?

By Mike Willson



Pic courtesy of Angus Fire

THERE HAS BEEN a rash of new allegedly “environment friendly” foams in the last 4 years particularly in the Class A (carbonaceous materials) foam arena. Many of these foams’ manufacturers claim much but struggle to provide hard independent data to back up their claims! Caution is definitely needed when assessing the suitability and performance of these foams for traditional applications, either as wetting agents or on the more difficult flammable liquid hazards. The marketing hype often exceeds the product’s real performance capabilities.

## HOW DO THEY WORK?

Class A foams fall into two broad groups called wetting agents and emulsifiers. Wetting agents when added to water at very low levels typically 0.1%–1%, reduce the surface tension of water to allow better spreading and penetrating ability into the carbonaceous material. This is sometimes referred to as “wet water”.

Emulsifiers are usually added to water in larger quantities of 1%–6% depending on fuel type and also claim successful fire performance on flammable liquid fuels. These are applied vigorously to the hydrocarbon liquids to deliberately encourage mixing with the fuel to form a non-flammable emulsion, breaking the fuel up into tiny droplets often referred to as “micelles”. Liquids frequently take on a milky appearance once emulsification takes place. These emulsifier products should only be promoted for shallow fuel layers as all the fuel is needed to mix with the emulsifier to achieve success – hence only very small demonstration fires are usually undertaken. In some instances the fuel (classified as a List 1 hazardous substance under the UK ground water regulations) is also very difficult to separate from the emulsion, so it cannot always be salvaged later and so could potentially end up as an aquatic pollutant in the environment.

There is a tendency with some emulsifying products for the hydrocarbon to separate out and float on top of the emulsion, with a resulting risk of sudden re-ignition. Emulsification does not occur on polar solvent fuels such as Isopropyl Alcohol or Acetone, so these Class A products are totally inappropriate for these hazards. It is

worth noting that emulsification requires high application rates on hydrocarbon fuels between 4 and 8 times that required for Class B (flammable liquids) foams which are generally far more effective on flammable liquid hazards and offer superior post-fire security for shallow hydrocarbon spills and deep seated fires.

## HYPE A DANGER TO LIFE SAFETY

Over-reliance on marketing hype is a dangerous trend which is capable of misleading users in a critical life safety area, and it can only be a matter of time before someone gets badly hurt – or worse – as a result. Claims like “radical new technology”, “most environment friendly product”, “revolutionary performance”, “uniquely versatile”, “truly flexible”, “all purpose” are easy to make but usually difficult to substantiate, so regrettably such phrases must be treated with caution, unless confirming hard data is provided.

## CLASS A FOAMS – NOTHING NEW?

Lets face it there is nothing radically new in this Class A foam technology. They are virtually all just basic Synthetic Detergent (SD) type foam derivatives (wetting agents and emulsifiers). These SD foams are fluorine-free and have been around for the last 50 years or so. These SD foams are highly effective in forestry and structural fire fighting applications, but with very few exceptions they are generally poor at Class B fire fighting. Some brands of SD foam like Angus Fire’s Expandol are approved and used as the leading foam for specialised Class B applications eg. ships engine rooms and the protection of Liquefied Natural Gas

hazards. However all SD wetting agents are unsuited to modern forceful fire fighting techniques at application rates which are most widely used on flammable liquid hazards by industrial and municipal fire fighters the world over.

## CLASS B FOAMS FOR FLAMMABLE LIQUIDS

All the foam types used for Class B applications from FluoroProteins (FP) to Film-Forming FluoroProteins (FFFP), Aqueous Film-Forming Foams (AFFF) and Alcohol Resistant versions (AR-AFFF/AR-FFFPs), rely on varying amounts of fluorochemical surfactants to achieve acceptable fire performance on modern hydrocarbons. The Alcohol Resistant (AR) types also rely on surfactants and water soluble polymers for polar solvent liquid hazards.

## WHAT DO YOU GET FOR YOUR MONEY?

The high prices charged for the more recent Class A foam offerings often imply complexity and innovation for what is still just a basic SD product – relatively cheap and easy to make. High profit margins on these new “environmentally friendly” products are simply funding high profits for the promoter/manufacturer who may not be around in 2, 5, or 10 years time when you maybe facing a problem. Also the big full page glossy advertising campaigns are no substitute for hard test data which is something you should all insist on – before purchase.

The claimed emulsifying action and extreme wetting ability is achieved by a simple synthetic detergent base of hydrocarbon surfactants with various additives, sometimes unusual ones like clays and other stabilisers, which add little to performance. These products emulsify fuel but in doing so, they incorporate so much fuel into the bubble blanket, that the resulting mix may ignite instantaneously when an ignition source is present. Additionally there is usually inadequate post-fire security.

## EMULSIFYING AGENTS – DOWNSTREAM DOWNSIDES!

Any emulsifying agents, by definition once they come into contact with hydrocarbon



liquids, will mix and carry them past fuel/oil water separator systems which are designed to trap hydrocarbon fuels and oils to prevent them entering rivers and water courses. Allowing them past just adds to any potential pollution problem by adding an iridescent film acting as an oxygen barrier across the water surface. Not only is the SD foam itself the most highly toxic foam type to aquatic life like fish and their food sources but also kills off the vitally important bacteria which live and process waste water in effluent treatment systems. All this from a supposedly very "environmentally friendly" concentrate.

### "ENVIRONMENT FRIENDLY" HYPE

The easiest way to recognise such hype is when claims are being made without test data to back them up. One emulsifying agent claiming to be "environment friendly" has been independently tested by a respected environmental test laboratory in Canada with shocking results. A staggeringly low 0.9 parts per million in water of emulsifying agent "F" poisons 50% of the Rainbow Trout test fish species. Incredibly low levels of this product in water courses will cause fish deaths, and carry polluting hydrocarbons into rivers. This product's manufacturer claims it to be "environment friendly" but avoids producing any firm independent data to substantiate it!

Other synthetic based foam manufacturers were facing a problem with their foam booster (di-ethylene glycol ether), which is classified as a "hazardous substance" after review by the Environmental Protection Agency (EPA) in USA. Some manufacturers have tried to clean up their products by reformulating using various propylene glycol ethers and called them "green foams" or "environment friendly" versions but this "second best" approach provides little if any environmental improvement and may lead to reduced fire fighting performance. There is not as much scientific data available on these propylene oxide based glycol ethers yet, to prove whether they are as bad environmentally as the well documented di-ethylene glycol ethers, but everything suggests they are likely to be. Far better to select a fire fighting foam which is completely glycol ether free and Angus Fire's Tridol ATF 3-3 is one of the rare synthetic based products formulated without any glycol ethers or Alkyl Phenol Ethoxylates (often used as film forming agents in AFFF/AR-AFFFs) present.

Confused? Then always ask for proof of toxicological and biodegradation data usually found on the product's material safety data sheet (MSDS). If these sections are empty, then it is time to be suspicious!

### ARE WETTING AGENTS REALLY FLUORINE-FREE?

Many wetting agents/emulsifiers are, but some are not. When analysed some of these products whose manufacturers claim they are free of fluorine additives have been found to contain significant quantities of fluorocarbon surfactants. So instead of being SD type foams they are in fact AFFFs. AFFFs incorporate fluorocarbon surfactants which have an important ability to reduce the surface tension of water. When mixed with water, the fluorosurfactant in these foams allows the water to penetrate carbonaceous materials very efficiently. It also

Key Criteria	UL requirements (NFPA18)	UL 162 requirements (NFPA 11, 16, 16A)	Notes
	<b>Class A Wetting agents (GOHR)</b>	<b>Class B Foam liquid concentrates (GFGV)</b> (also suitable for Class A use).	Separate listings and test criteria by UL confirms these are NOT comparable agents.
Fire test	2" layer n-heptane on water 4.65m <sup>2</sup> (50sq.ft.) 1min preburn	2" layer n-heptane on water 4.65m <sup>2</sup> (50 sq.ft.) 1min preburn	55 US Galls (208 litres) fuel on each test.
Application rate	8.15L/min/m <sup>2</sup> (10 USGPM/sq.ft)	1.63L/min/m <sup>2</sup> (2 USGPM/sq.ft)	5 times higher application rates for wetting agents on the same test
Extinguishment time	No time limit (pan must not overflow).	3 minutes or less for full extinguishment.	Unlimited dilution of fuel providing pan does not overflow.
Water used	Fire test with fresh water only.	Fire tests using fresh and salt water.	Wetting agent foams work much better with fresh water than salt water.
Vapour seal tests	None	2 seal tests during a 9 minute waiting period.	Confirms ability to seal against hot metal and prevent vapour escape and risk of re-ignition.
Burnback tests	None	Foam blanket must withstand flame attack for at least 5 minutes after foam blanket has rested for 9 minutes from fire extinguishment.	Critical for post fire security.
Polar solvent tests	None	AR type foams only for use on alcohols and other polar solvent fuels.	Oxygenated gasoline additives are polar solvents, so special high performance foams may be required.
Film-forming tests	None	AFFF/FFFP and AR type foams only.	Film-formation provides fast fire knockdown on shallow hydrocarbon spills.
Foam quality tests	None	Extensive tests	Similar foam quality that extinguished the fire tests must be reproducible from commercially available foam equipment.
Induction tests	None	At ambient and minimum use temperature	Critical to ensure the foam concentrate can be adequately proportioned, all year round.
Foam drum tests	None	Detailed tests to prevent splitting/leakage when dropped	Critical to ensure foam is not wasted through poor quality drum supply.
Foam equipment tests	None	Foam quality tests Air-oven ageing tests Salt-spray corrosion tests Proportioning accuracy tests Plastic/rubber component tests Pressure tests	Critical to ensure foam equipment is fit for purpose and provides foam quality capable of extinguishing fires.

helps reduce the amount of hydrocarbons the detergent would otherwise incorporate into the bubbles, yet it cannot stop this emulsifying action completely so more fuel is picked up than if a completely detergent free FFFP foam were used.

### MULTIPURPOSE?

Multipurpose is a term widely understood to apply to Class B foams in the fire industry referring to an AR foam's ability to be effective on Class A materials, hydrocarbon fuels and polar solvent fuels when applied through a range of application techniques including non-aspirated attack, low expansion systems and deeper medium expansion layers for rapid coverage of large exposed areas like bund/dike areas surrounding bulk storage tanks.

Several Class A foam manufacturers have begun using this multipurpose term to reflect their product's supposed ability on Class A, Class B and Class D (metal) materi-

als and imply that it is in some way suitable for a wide range of hydrocarbons and polar solvent fuels. This is misleading and potentially dangerous as virtually all Class A foams do not work on any polar solvents and should not be introduced on any metal fires. It is well known that water based media are not appropriate for metal fires and can give additional "explosive" hazards, jeopardising fire-fighter safety. Only specialised dry powders, sand or glass beads are the appropriate methods of control and extinction of metal fires.

Class A foams have been shown to require excessively high application rates of 20 litres/min/m<sup>2</sup> or more to be effective on hydrocarbon liquid fires – five times more than the application rates required for Class B foams. Water based products can cause explosive results on metal fires. Several of these Class A emulsifiers have been found to be foam destructive so they can collapse other foams or impair their performance by contamination on the ground at the inci-

dent. If used first they could adversely affect the fire fighting ability of other Class B foam applications, and if used either alongside or afterwards could breakdown the protective foam blanket and increase the risk of re-ignition potentially threatening fire-fighter safety.

### CAN YOU REALLY EXPECT CLASS B PERFORMANCE FROM WETTING AGENTS?

Several wetting agents are being promoted as equivalent performance to Class B foams but let us examine that in a little more depth.

UL has a standard for wetting agents and there are perhaps a dozen products listed. These tests are largely focussed on a range of Class A materials, but there is a Class B heptane fire test which is significantly different to the fire tests in the Class B foam standard UL 162. The table opposite shows the key differences between the two standards:

It is therefore clear that the Class A wetting agent/emulsifier foams are not equivalent to Class B foams as they do not pass any of the key criteria tests under UL 162. If they did, they would also be listed as Class B fire fighting foam concentrates and not just wetting agents. Angus Fire has recently developed a modern F3 Fluorine-Free Foam called Syndura, which is a true high performance Class B 6% foam concentrate without any Fluorine but with full UL 162 listing. This product is aimed at the aviation and military sectors and can be used at just 3% for training to further minimise the environmental impact. It has fast knockdown mimicking an AFFF with excellent burnback performance. It is also certified to ICAO level A and has extinguished realistic fire scenarios involving 3,000 litres of Avtur in a 280m<sup>2</sup> bund with simulated crashed aircraft in under 50 secs with 90% control times under 30 seconds. Still it does not meet ICAO Level B and any fluorine-free products claiming to do so should be tested at summer ambient temperatures to verify suitability for year round performance, otherwise passengers, crew and firefighters lives could inadvertently be put at risk. It is certainly not helpful to the foam user to purchase a product that only meets its certification level in the coldest winter months!

### FOCUS ON CLASS B FOAMS FOR PERFORMANCE AND INNOVATION

Without doubt it is currently Class B hazards where the advances in fire fighting foam technology is really taking place with exciting new cutting edge developments.

Although it is possible to reduce the harmful impact of synthetic based foams by designing out the nasties as far as possible, synthetic foams by their very nature have certain immutable characteristics, like emulsification with hydrocarbons. Synthetic based foams inevitably carry these fuels past the oil/water separators which are especially designed to retain these pollutants. Angus Tridol ATF is an example of just how far you can take this process forward with synthetic based foams, but using a natural protein based product which is detergent free and consequently does not emulsify hydrocarbons yet offers genuinely more environmentally gentle formulations, has to be the way forward.

Products like Angus Fire's latest multipurpose foam development Niagara, are now forging a huge technological lead in this

field. This foam is widely applauded as a major step forward in overcoming one of the biggest drawbacks of existing AR foam technology. Niagara is the world's first high fluidity AR-FFFP without a polymer barrier protecting against solvent attack. This foam is also fully tested and listed by Underwriters Laboratories Inc.(UL) under their UL 162 tests, for application through portable equipment, fixed foam systems and foam enhanced bulb sprinkler systems for use year round down to -18°C. Niagara is the first AR foam to be UL listed below +1.7°C, and offers environmentally gentle benefits from its natural protein base material. Niagara has also been shown to work effectively as a wetting agent on Class A materials at just 0.8% induction rate – something beyond the ability of any polymer containing AR foam. So if you need a truly multipurpose easy handling foam for Class A and Class B risks all year round which genuinely has low environmental impact, then look no further than Niagara AR-FFFP 3-3 from Angus Fire, the world leading innovators in foam technology.

Of course having the best foam concentrate is one thing, but it does have to be proportioned correctly and reliably into the water supply to achieve foam application onto the fire.

### FOAM CONCENTRATE PROPORTIONING

Foam concentrate induction and proportioning systems are the means by which any foam concentrate is introduced into the mains water stream, to produce foam solution. The foam solution is then supplied to a finished foam maker, generator or other delivery device before application onto any fire. For this reason the induction device should be considered the heart of any portable fixed or semi-fixed foam system. Care must therefore be taken to ensure that the correct proportioning method is chosen.

There are a number of different ways in which foam concentrate induction can be achieved, each of which has its own advantages, limitations and suitability for particular applications.

The different induction methods can be

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Pic courtesy of Angus Fire

considered as being split into two distinct categories:

#### A. CONSTANT FLOW

This can be defined as the condition where the foam solution demand is constant, or can be regarded as constant, so the flow is either fully on or off. For example, where a single fixed discharge device is being fed with foam solution like a foam branchpipe or a foam monitor.

#### B. VARIABLE FLOW

This can be defined as the condition where the foam solution demand may vary across a wide range. For example, where a number of discharge devices maybe required to operate independently or simultaneously. This normally relates to vehicle systems and fixed foam systems, like tank protection systems, monitor systems and loading bays – where each one may be required to operate on any two of the three at one time, so the flow varies.

#### A. The most commonly found CONSTANT FLOW application systems are:

- (i) Portable In-line inductors (eductors)
- (ii) Direct pumping
- (iii) Water motor systems
- (iv) Fixed In-line inductors (eductors)

#### (i) Portable Inductors (Eductors)

Portable inductors are probably the most widely used form of foam proportioning device. It uses the Venturi principle, a low pressure area is created when the mains water flow passes through the inductor nozzle. Foam concentrate is drawn in at this point, and mixes with water to produce foam solution.

The best and most accurate of these devices have separate 3%AR and 6%AR settings for the more viscous polymer containing AR type foams as well as 3% and 6% settings for standard Newtonian foams. (alternative 1%AR and 3%AR versions are also available for 1x3 foams).

#### (ii) Direct Pumping

The simplest type of pump system comprises a pump designed to deliver the correct quantity of foam concentrate at a pressure in excess of that of the mains water.

It is common to use some type of positive displacement pump, powered by an electric or internal combustion motor to produce a constant volumetric output at a required pressure.

The foam concentrate is then pumped through a constant flow valve or orifice plate directly into the mains water supply.

#### (iii) Water Motor Systems

These are similar in operation to (i) except that instead of using an external power source to drive the foam pump, a water driven Pelton wheel motor is used which is driven by a small quantity of fire main water like the Angus Helijector for 1% induction systems on

offshore platforms.

As such, they can stand totally independently and require no secondary power source.

#### (iv) Fixed In-Line Inductors (Eductors)

These are probably the most commonly found units for constant flow applications and provide a cost-effective, simple and reliable method of proportioning, foam concentrate. These are usually factory calibrated to meet a specific flow and pressure requirement with a non corrosive 316 stainless steel body for long life.

Using the Venturi principle, a low pressure area is created when the mains water flow passes through the inductor nozzle. Foam concentrate is drawn in at this point, and mixes with water to produce foam solution.

Advances in foam induction technology mean that inductors can now be factory-calibrated for a wide range of pressure and flow conditions within stated operating bands.

There are few restrictions on the downstream conditions which means that the common problem of mis-matching can largely be avoided.

The leading manufacturers have developed computer programmes to facilitate the calibration of these inductors. One of the major benefits of this program to the fire professional is that the effects of changes to any of the operating conditions can be accurately predicted. All the necessary information is provided to make the most effective use of the water, pumping and foam resources available, whilst maintaining acceptable safety margins.

In-line inductors are:

- Reliable
- Cost-effective
- Simple to install and maintain
- Require no external power source

There is, however, typically a 40% pressure loss across each unit in the same way as there is with the portable inductor units.

#### B. VARIABLE FLOW APPLICATIONS

A typical situation might be, for example, where a number of foam cannons are located around an installation and may be required to operate individually, simultaneously or in different combinations.

The foam concentrate induction system which can cater for this need for accurate induction rates across large varying flows, is usually of the balanced pressure type, and the key component is the Balanced Pressure Proportioner, normally made in gunmetal to avoid any corrosion from saline water supplies or the more aggressive synthetic detergent based foam concentrates.

The basic design requirement is to arrange the induction system so that foam concentrate and mains water are delivered

to the proportioner at exactly the same pressure. By introducing the foam concentrate, via a metering orifice, into the low pressure area at the neck of the Venturi, foam concentrate and mains water are supplied to the proportioner at the same pressure.

When the foam solution demand changes, the pressure difference between the water and foam solution will alter, but the relationship between them will remain and be maintained.

The two most commonly-found ways of achieving the required matching of foam concentrate pressure with that of the water at the inlet of the proportioner are either a bag tank module, or a balance valve.

#### BAG OR BLADDER TANKS

With a bag tank (or bladder tank), foam concentrate is stored within a butyl rubber bladder which is fixed inside the steel pressure vessel. When the system is operated, water at fire main pressure, enters the tank between the vessel wall and the rubber bag. Foam concentrate is then expelled from the bag into the Balanced Pressure Proportioner.

As mains pressure is used as the power source, the foam concentrate will always be discharged at the same pressure, and any variations in flow will be automatically compensated for.

Features of the bag tanks include:

- By virtue of the proportioner, foam concentrate proportioning over a wide and varying range of foam solution demands can be accurately maintained.
- Angus bag tanks can be refilled during operation and are designed in accordance with BS5500.
- They are self-contained and require no external power source.
- There is a minimal pressure loss across the proportioner.
- They are simple to install and easy to operate and they require minimum maintenance.
- We have a range of sizes 450, 1125, 2250, 3375 and 4500 litre capacity.

#### BALANCE VALVE

A dedicated foam pump supplies foam concentrate at a continual over-pressure and a balance valve reduces this to the control pressure, returning the excess flow to tank.

#### CONCLUSIONS

If foam proportioning systems are the “heart” of any foam system, then the foam concentrate is like the “blood” pumping round the system fighting off “external attack and disease” from within. But like modern medicines, the selection of the right foam is critical to be able to control and “fight off the disease” or fire attack expected.

Multi-purpose AR type foams are the most versatile and the leading polymer free technology products like Niagara can address many different types of hazard including 1% on hydrocarbon spills, 3% on deep seated hydrocarbon and polar solvent fires, 3% or 6% for vapour suppression of unignited fuels or non-flammable hazardous liquids and just 0.2–1% for Class A/wetting and compressed air foam system capabilities. All other foam types have varying degrees of more specialised application, without this all purpose capability.


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# Lightweight P



Picture courtesy of Hale Europe

By David Burton

a quick and safe method of stopping the unit and containing the fuel. Carrying handles attached to the frame are considered essential. The option to fit wheels to the pump frame is a simple way of improving portability. Certain models incorporate engine oil cooling to safeguard the engine in prolonged use.

Priming systems are an important consideration. Pumps are now available with piston prime, hand prime or the long established exhaust gas ejector system. With the use of vacuum and pressure gauges to guide the pump operator, quicker priming and more efficient pump operation is possible.

In addition to these features portable pumps are now able to incorporate features such as electric starting, vacuum and pressure gauges and lighting. The 12 volt battery system can provide the power for a lighting mast and tachometer.

In the not too distant future portable pump design and manufacture will be subject to the European standards devised by the CEN (Comité Européen Normalisation). A technical committee, CEN/TC 192, comprised of leading European pump manufacturers has been devising these standards, currently defined as prEN 1028. The definition of a portable pump is defined as – “Portable pumps are motor pumps designed for fire-fighting which can be

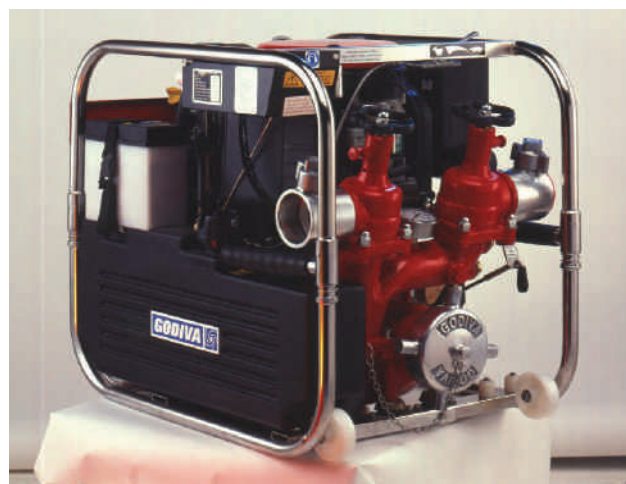
THE LIGHTWEIGHT PORTABLE PUMP has always been an important part of the fire-fighter's equipment, it is a versatile unit playing many roles – supplying water from open sources to the main vehicle pump, as a back-up to the main pump and as a pump to relieve flooding. There are increasing demands for a portable pump to be lighter, more compact and still give a powerful performance, as the space available in appliance compartments becomes more restricted, particularly with the deployment of Positive Pressure Ventilation Fans (PPVs). A typical portable pump performance is rated at 800l/min at 5 bar and capable of 1400l/min at 3 bar, but is contained within a 520 x 490 x 584mm envelope.

There are also the forthcoming European prEN standards for portable pumps to be considered, these primarily address health and safety aspects as well as important pump features, such as operator controls and instrumentation.

Although lightness and compactness are high priorities, durability and a high build quality are not to be compromised. Features such as wrap-around stainless steel frame and corrosion protection for all parts in contact with petrol, grease and water are essential. The power source for a portable pump is typically a lightweight petrol or diesel engine, reliable, air-cooled, 18 BHP overhead valve engine, which is quiet, yet powerful. Servicing of the pumps

should be straightforward and all the necessary spares inexpensive and readily available. The Manufacturer's warranty is expected to be at least 12 months duration.

Safety is, as always, a high priority with particular attention focusing on the engine exhaust. If possible, this must be fitted with a guard to protect the operator from high temperatures. An easily accessed fuel shut off valve should also be fitted to provide



Picture courtesy of Hale Europe

# Portable Pumps

transported by hand to the site of operation and which are driven by a combustion engine. Portable pumps are intended to be not permanently mounted in fire-fighting and rescue service vehicles. This European standard deals with significant hazards, hazardous situations and events, arising from portable pumps used as intended or arising from conditions foreseen by the manufacturer or the manufacturer's authorised representative. It addresses the construction, setting, and operation of the portable pump."

The CEN standards documentation then proceeds to list the safety and protective measures required, these are some of the salient points –

## 5.1.2.1 TRANSPORTING DEVICES AND LOSS OF STABILITY

The portable pump shall have carrying handles or an adequate frame design to transport it according to the manufacturer's manual. The handles shall be designed to withstand at least 2.5 times the mass lifted divided by the number of carrying handles

Another area addressed is the capability of the pump to operate on an incline –

## 5.2.5.1 INCLINATION DURING OPERATION

At nominal delivery rate the portable pump shall be fully operational in all directions up to a slant of 15° from the horizontal.

Other sections cover –

## 5.1.2.3 MANUAL STARTING DEVICE

If a manual starting device is used it shall be safe from kick back. If a handle starting equipment is used it shall be according to EN ISO 11102

The noise factor is also addressed –

## 5.1.5.1 NOISE REDUCTION AT SOURCE BY DESIGN

The noise at the operating position shall be as low as practicable by design . . . EN ISO 11688-1 applies.

## 5.1.5.2 NOISE REDUCTION BY PROTECTIVE MEASURES

If it is not possible to achieve the noise reduction at the source by design

methods, the manufacturer shall, whenever practical, equip the machine with devices such as noise enclosures, silencers etc.

## 5.1.6 ELECTROMAGNETIC COMPATIBILITY

### 5.1.6.1 GENERAL

Electromagnetic emission and immunity of the device shall be controlled so that it poses no threat to the surrounding environment, furthermore the device must be immune to the environment it has to function in.

### 5.1.6.2 RADIATED EMISSION

The device shall not interfere with any radio reception in the vicinity of the device, as the operator of the device shall be able to get information regarding the operation.



Picture courtesy of Hale Europe

The standard addresses areas such as the displays and controls –

## 5.1.83 ALL INSTRUMENTS SHALL BE VISIBLE FROM THE OPERATOR'S POSITION

Manual controls and other operating devices shall be easy to reach and operate without unreasonable effort.

## 5.2.14.1 OPERATING CONTROLS

All operating controls shall be capable of being operated from one position (operator position).

An adjuster for the engine speed. Advice for stopping the engine. An actuator for suction (if required). A cold start device (if required).

The fuel system for the pump must provide sufficient fuel for one hours running at the rated delivery performance –

## 5.2.11.1 INDEPENDENT OPERATION

Independent operation at nominal delivery rate shall be ensured with a permanently installed fuel tank for at least one hour.

The maximum weight of a portable pump is defined as –

The maximum mass with the engine fully operational . . . shall not exceed 200kg  
The unit is required to be fully operational from a cold start

## 5.2.6 COLD START

The engine shall be capable of operating under full load immediately after starting from cold conditions specified in EN 1028.

The standards also extend to cover the documentation that should be supplied with each pump, the instructions must cover transport and storage, description of the pump, commissioning, startup, operation and shutdown. The instructions must of course cover maintenance, servicing, faults, causes and remedies.

Of course, a great number of these points are already being addressed by pump manufacturers as an integral part of a continuous product improvement policy. It is essential for the pump manufacturer to consult the end user from the early stages of new product development to ensure the pump meets, and where possible, exceeds the fire-fighter's requirements.

The performance and standard of portable pumps available for fire-fighters continues to improve mainly due to the combination of customer's expectations, competing manufacturers and the introduction of exacting European standards.

## DAVID BURTON

Hale Products Europe LTD

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The threat of terrorist attack adds to the potential hazards faced by emergency services and the public. New decontamination techniques have been developed to compliment those already well practiced in industrial incidents. Equipment is constantly evolving not only to contend with the current situation but to anticipate future threats associated with nuclear, radiological, biological and chemical incidents.

Hughes Safety Showers has used its 35 years experience in emergency safety showers and decontamination systems to develop a new generation of decontamination shelters that take into account the potential terrorist threat. Some are designed for mass decontamination of the general public, while others are for use by the emergency services for decontaminating their personal protective clothing and small items of equipment.

One of the latest mass decontamination units introduced by Hughes is the CUPOLAdecon5. It has latitudinal access which means casualties enter and leave through the sides of the unit. Once they are inside, the entrance flaps are zipped down to provide privacy and protection from the outside conditions.

Casualties pass along one of five separate channels, which can be designated for men or women. In addition, internal partitioning can be rearranged to accommodate stretcher cases or members of the emergency services so that they can monitor the decontamination process. Decontamination is carried out in three stages. In the first, casualties de-robe and shower with a detergent or additive in the shower water. They then move into the centre section where they stand under fresh water rinsing showers. Alternatively, the rinsing showers can use water, which includes a treatment addi-

tive. Male and female casualties then pass through to the third and final section where they dry off and re-robe.

This unit has already proved to be very popular, particularly in the USA, and includes several important design features that have evolved as a result of extensive testing and trials in co-operation with civil and military authorities. Three or four channel variations of this basic design are also available.

Decontamination shelters consist of a frame with removable lining and the choice is usually between rigid or inflated structures.

From the outset, Hughes favoured the inflatable option and subsequent experience has shown that shelters using this design are much easier to erect, more durable and require less training, furthermore, they are infinitely more stable in bad weather and strong winds. They stand up better to repeated erection and dismantling; something which is inevitably necessary when training. Bent or damaged rigid frames are notoriously difficult, if not impossible, to erect.

All joints are glued and taped rather than welded. This is another feature common to the entire inflated Hughes range. Contrary to what may have been expected before extensive trials were carried out, this type of joint has proved to be far more durable and easier to repair than the welded alternative.

One of the less obvious features the Hughes concept demonstrates is the attention to detail necessary if decontamination is to be carried out successfully. Floor panels within the shelter ensure that casualties are not standing in the contaminated wash-off. Shelters should be positioned on level ground but, of course, this is not always possible and a slight incline can soon raise run off levels at one side of

*Hughes CUPOLAdecon1 mass decontamination unit decontaminate up to 300 people an hour and ensures a speedy, reliable and robust response to any incident.*

the shelter above the top of the floor panel. To combat this Hughes have increased the height of the floor panels to ensure that casualties are protected.

Flexibility in the face of a continuously changing threat is clearly an advantage. The CUPOLAdecon1, for example, is very similar to the CUPOLAdecon5 but uses longitudinal access with casualties entering and leaving through the ends of the unit. With this arrangement several units can be connected together on site to form a multi-stage mass decontamination facility. One unit could be used for de-robing, one for showering and a third for re-robing. This unit can also accommodate members of the emergency services as well as the general public.

Although by no means the only consideration, cost is nevertheless important. The ability to get maximum benefit from any investment can prove a strong argument; the Hughes CUPOLAdecon2, is a perfect example. Although primarily intended for decontaminating members of the emergency services, it is equally capable of treating members of the public. Recent trials have indicated a potential throughput of 100 people hour, more than enough for many incidents and certainly not restricted to countering the terrorist threat.

This no doubt explains why the Hughes CUPOLAdecon2 is now the British Fire Service standard decontamination unit, with over 200 in active service and a growing number being adopted around the world. It is exceptionally flexible and capable of responding to a wide range of incidents. The ideal all round solution.

Continuing development of systems and equipment will ensure that the emergency services are well prepared to protect themselves, and the public. Designs will evolve through continued experimentation, experience and above all, close co-operation with those on the front line.

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# Big Guns

By Dwight P. Williams, President, and Kelvin M Hardingham, European, Africa & Middle East Manager, Williams Fire & Hazard Control, Inc.

*Pic courtesy of Williams Fire & Hazard Control Inc.*

IN THE FIRE PROTECTION INDUSTRY, what does the term "Big Gun" mean? If the fire professional were faced with a 12 m (40-ft) diameter storage tank fire, a 1,892 lt/m (500 gpm) master stream nozzle would be more than adequate to provide the required volume of water/foam solution for extinguishment. In fact, the nozzle would actually be more than double the minimum volume requirement 760 lt/m based on 6.5 lt/m per m<sup>2</sup> (201 gpm @ 0.16 gpm/ft<sup>2</sup>).

Looking at this scenario one might call the 1,892 lt/m nozzle "Big". On the other hand, if the fire professional is faced with a full surface fire on a 76 m (250-ft) diameter storage tank, the same 1,892 lt/m nozzle would only supply a fraction (5%) of the water/foam solution required – 37,800 lpm based on 8.15 lpm per m<sup>2</sup> (10,000 gpm @ 0.20 gpm/ft<sup>2</sup>). In reality, a master stream nozzle is not considered a "Big Gun" if its volume is less than 25% of the total volume required; hence the term "Big Gun" is relative. The purpose of this article is to inform the fire fighting industry on the application of "Big Guns" and why they should be considered based on a history of success.

Looking at the Oil/Petrochemical Industry, it is apparent the hazards have grown immensely. Fire fighting equipment, technology, and techniques are just now beginning to catch up with the hazards facing the Fire Professional today. The table below is an example of how dramatically industrial fire protection, equipment, and apparatus have changed over the past 25 years relative to the increase in hazard.

## MISSION: EXTINGUISH THE FIRE, MINIMISE LOSS, AND MAXIMISE SAFETY

In order to be successful in the mission, many obstacles must be overcome. Large fires require large volumes of water. Establishing a fire water system in the time of an emergency, is a

monumental task. To move copious quantities of water from its origin to the seat of the fire requires knowledge, equipment and resources. The use of "Big Guns", in the event of an emergency reduces the logistical problems that will be incurred using many lower flow volume monitors.

## Example: 76 m (250-ft) Diameter Storage Tank

In order to achieve the water/foam solution volume using 1,890 lt/m (500 gpm) nozzles, it would require a total of 20 individual nozzles. However, if 19,000 lt/m (5,000 gpm) nozzles were chosen (WF&HC 1x6 Gun automatic pressure control "Ambassador" Hydro-Foam™ Nozzle Technology), the task can be completed with two nozzles. The use of two "Big Guns" in place of 20 smaller nozzles does not change logistical problems associated with water volumes, foam concentrate supplies, adequate hose supplies, etc. However, it greatly reduces the risk and exposure to personnel while simplifying operations because less equipment is involved, the distance from the hazard is increased, and more water/foam solution is delivered to the surface.

The above paragraph states the obvious differences between larger nozzles

### Changes in Industrial Fire Protection over the past 25 years

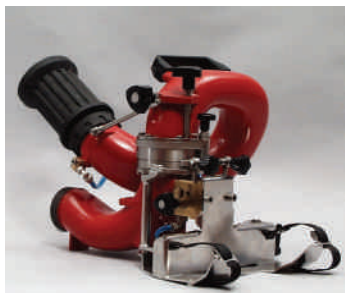
	1976	2001
Storage Tank Diameters	38 – 46 m (125'-150')	+105 m (+345')
Foam Delivery Nozzles	1,890 – 3,780 lt/m (500 – 1,000 gpm)	< 53,000 lt/m (< 14,000 gpm)
Fire Hose	65 mm (2½")	5", 6", 8", 10" & 12"
Standard Foam Pumps	3,780 lt/m (1,000 gpm)	– 7,500 lt/m (2,000+ gpm)





Pic courtesy of Williams Fire & Hazard Control Inc.

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and smaller nozzle flows. Some of the not so obvious advantages include; effective range, application density, and foam runs.

#### EFFECTIVE RANGE

A definite advantage in the utilization of “Big Guns” is the additional range produced by higher flow master stream delivery devices. 7,500 l/m (2,000 gpm) delivery devices have effective ranges in excess of 76 m (250-ft) and the ranges increase as the volume increases. For example a 12 m (40-ft) high, 76 m (250-ft) diameter storage tank in a 190 m (625-ft) square containment dike, the distance separating the tank shell from the 1.5 m (5-ft) high dike walls is approximately 57 m (188-ft). This means that our nozzle must be able to provide ranges exceeding 57 m (188-ft) at a height greater than 12 m (40-ft) just to reach over the tank wall. The foam still has to travel some 76 m (250-ft) across the burning fuel surface. One consideration would be to increase the size of the delivery device, however that may not be practical. Extending earthen work platforms into the containment area to be utilized for delivery device placement is an effective way to stretch potential and maximize the resources available. Predominate wind direction is normally one of the priority criteria for placement. Other considerations, like access and water supply are equally important. This is naturally best identified and planned for prior to an incident during site surveys, risk analysis, and fire pre-planning, however, many work platforms have been excavated during emergencies.

#### APPLICATION DENSITY

One benefit in utilizing “Big Guns” is the increase in application density over smaller nozzles. Application density can be defined as the amount of water/foam solution being applied divided by the surface area on which it is landing.

#### Example

A 12 m (40-ft) diameter gasoline storage tank with a full surface fire would require an application of water/foam solution at the rate of 735 lpm (201 gpm) based on 6.5 lpm per m<sup>2</sup> (0.16 gpm/ft<sup>2</sup>). If the area of impact of water/foam solution was the entire surface of the tank, the application density would be 6.5 lpm per m<sup>2</sup> (0.16 gpm/ft<sup>2</sup>). However if our 735 lpm (201 gpm) water/foam solution was localized in a .93 m<sup>2</sup> (10 ft<sup>2</sup>) area on the surface of the tank, our application density would increase to 817.5 lpm (20.1 gpm/ft<sup>2</sup>).

In our example above, by focusing the water/foam solution to a small defined area we were able to increase the application density 125 times. This increase will secure the .93 m<sup>2</sup> (10 ft<sup>2</sup>) area rapidly. As the foam spreads across the fuel surface it continues to secure and suppress vapors until the entire surface area is blanketed.

#### FOAM RUNS

A Foam Run is the measured distance that finished foam travels across a fuel's surface. A foam blanket should not be expected to run more than 30 m (100-ft) from the point of impact on the surface of a burning fuel.<sup>1</sup> Degradation of the foam blanket due to intense heat, plunging, solubility of the fuel, and quality of the foam concentrate will effect these foam runs. One should consider prior to establishing a foam attack (preferably during pre-planning) the distance that the

<sup>1</sup>Foam runs can be as low as 21 m (70-ft), on MTBE, MTBE blends, and Hot Crude Oil

foam blanket would have to travel once it is on the fuel surface. A patented methodology, coined The "Foot Print"<sup>™</sup>, has been developed by Williams Fire and Hazard Control, Inc. to assist in determining these calculations.

#### THE "FOOT PRINT"<sup>™</sup>

The terminology "Foot Print"<sup>™</sup> is defined as the measured area of impact of a given delivery device (length and width) on straight stream. The "Foot Print"<sup>™</sup> methodology is as follows. Since it has been determined that a foam blanket (in most cases) will travel no further than 30 m (100-ft), the finished foam must be directed onto the surface so as not to exceed these distances.

First, one must determine the "Foot Print"<sup>™</sup> of the selected nozzle to be used. Next, calculate the placement of the nozzle in relationship to the tank (distance from the tank), and then determine the placement of the "Foot Print"<sup>™</sup> onto the surface area.

The outer perimeter of the "Foot Print"<sup>™</sup> must be positioned where it will not exceed the 30 m (100-ft) maximum distance from any portion of the tank wall. If the distances exceed the 30 m (100-ft) maximum and nozzle placement cannot make up the difference; additional or larger nozzles



*Pic courtesy of Williams Fire & Hazard Control Inc.*

must be considered. In all cases involving storage tanks greater than 55 m (180-ft) in diameter the application rate increases due to the increased flows necessary to create a "Footprint" large enough to facilitate "foam run" requirements.

#### SELECTION

"Big Guns" are a necessity if one is to be successful in combating large flammable storage tank fires. The reason for the development of the 53,000 lt/m (14,000 gpm) nozzle is the same reason

for the development of the 1,890 lt/m (500 gpm) master stream. As hazards increase in size we must increase the size of our delivery devices to assure ourselves the greatest advantage over the enemy . . . FIRE!

#### SELECTING A BIG GUN

When selecting a "Big Gun", range of motion is important. An example would be a 7,500 lpm (2,000 gpm) nozzle deployed to a process unit fire. This selected nozzle must not only meet the flow and effective range requirements,

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Pic courtesy of Williams Fire & Hazard Control Inc.

it must have the ability to reach high (nearly vertical) onto a tower, below horizontal for ground spills and manifolds, and traverse in excess of 45 degrees side to side. "Big Guns" rated at higher flows (ie. 15,000 to 53,000 lpm [4,000-14,000 gpm]) generally do not have the ability to go below horizontal because of the tremendous reaction-force created by such large volumes. This should be considered when setting up on a large diameter >55 m (180-ft) storage tank fire involving a manifold and ground spill fire. The nozzle(s) needed to extinguish the tank may not have the ability to go below horizontal enough in order to effectively cover the manifold and ground fires; therefore a smaller "Big Gun" (ie. 7,500 lpm (2,000 gpm) may be the answer.

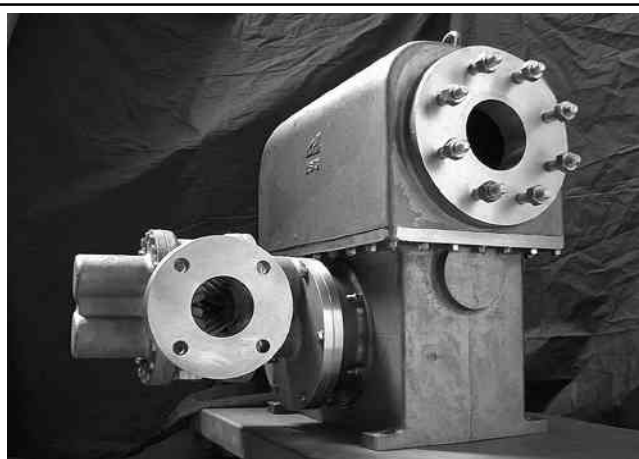
When manifolds are involved, they normally present another concern; a "Three Dimensional Fire (3-D)" or "Pressure Fire". Current technology has provided the answer to this problem

with the advent of the Hydro-Chem<sup>®</sup> nozzle. This end-of-line delivery device allows not only the foam concentrate to be delivered to the self-educing nozzle remotely, >150 m (500-ft) but allows dry chemical to be delivered through the fire stream to the target. The water/foam stream actually carries the dry chemical as far as the nozzle's effective range.

#### MTBE/BLENDED GASOLINE

Another "Special Hazard" has recently been the topic of discussion; "MTBE/Blended Gasoline". It is one more scenario that "Big Guns" are not the total answer. Tests prove that storage tank fires involving this product and others like it react much the same as the non-blended hydrocarbon fires up to the point of flame collapse. At that point, the characteristics change dramatically. What you can't see from the ground is the faint blue flame (known as "ghosting") dancing on top of the foam blanket waiting for you to get comfortable. Until recently you had a choice, continue foam application (plan for a minimum 3-hour attack) or loose your foam blanket!

Williams Fire & Hazard Control, Inc. has conducted large-scale fire tests on MTBE using the combination of "Big Gun" Technology and the newly released "HCAN"<sup>™</sup> (Hydro-Chem Aerial Nozzle<sup>™</sup>, in 2,800 lpm & 3,750 lpm (750 gpm & 1,000 gpm). These tests proved that, the proper application of inner wall cooling (water/foam solution) and dry chemical "over the top" can successfully extinguish these exotic fires within a reasonable amount of time, thus reducing personnel exposure and preserving valuable resources (foam/\$/R). Hydro-Chem<sup>™</sup> nozzles are also available in a variety of rated flows from hand held 225 lpm, 360 lpm & 475 lpm [60, 95, & 125 gpm] Hydro-Chem<sup>™</sup> Handguns are not self-educing nozzles) to 7,500 lpm (2,000 gpm) trailer mounted monitors.



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#### THE TOTAL PACKAGE

This article is the result of many years of research and experience. Practically speaking, much of today's technology as accepted by Industry as "science" is incomplete. Our experience has proven that a vital part of the equation is "art". It is the balanced combination of "Science" and "Art" along with our patented methodology of extinguishment that result in the "Successful Extinguishments" Williams Fire & Hazard Control, Inc. is noted for.

In selecting components for your arsenal, consider your water supplies (pressure and volumes) compared to your hazards. If your water supply, and "proven foam supplies" are inadequate, verify to make sure your insurance coverage is not!

**Register now for the 11th Annual Les Williams Advanced Flammable Liquid Firefighting Foam Technology Workshop, June 14-17th 2004 Beaumont, Texas.**

**To Register, contact:**

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## SWIFT (STATION WITH IMMEDIATE FIRST-AID TREATMENT)

**D**r Ting Choon Meng, a GP by trade and also a medical Officer in the rescue battalion of the Singapore Civil Defence Force found himself wasting precious time setting up mass casualty stations during his training activities.

He thought that maybe this is only the case in Singapore. But after a lot of research he concluded that this was the same the world over and in fact even in the USA, mass casualty situations are also still dealt with in this way.

Having concluded that there must be a better way, he sat down to develop a mobile base unit, which could be deployed quickly and provide more support for the medics at such incidents. Hence SWIFT was born.

Since its inception, several major manufacturers worldwide have expressed interest in promoting the concept, with particular interest being shown by the Homeland Defence team in the USA.

### WHAT IS SWIFT?

The SWIFT (Station with Immediate First-Aid Treatment) is designed as a self propelled Emergency Medical Station (EMS) for management of casualties at the site of incidents. During rescue missions, casualties at the incident site have to be treated and stabilized prior to transporting them for more definitive management at hospitals. During peacetime, the vehicle can also be deployed during civil disaster as a frontline Accident and Emergency Station.

### CURRENT SITUATION

Presently, whenever the medical platoon is activated, the medical platoon will draw out the necessary tents and medical stores from the base camp and proceed to the incident site. Upon reaching the incident site, 10-12 men are needed to unload the tents and medical stores to setup the First Aid Point (FAP). They will take approximately 20 minutes to complete the setup.

At the incident site, the Fire Fighting and Rescue Troops will transport and place the first wave casualties rescued at the Triage Area to await medical attention from the Medical Platoon. Currently, however, triage and treatment can only commence after the Medical Platoon has completed the setup of the FAP. Precious time is lost at the setup of the FAP for the medical platoon to attend to the first wave casualties.

During treatment, the medical platoon will face difficulties in performing the tasks of treatment as certain medical equipment is not available given the limited load they are able to carry on the transporting lorry. Some medical

procedures, such as cardio-pulmonary resuscitation are also performed under suboptimal conditions. There is a lack of water for cleaning the casualties, oxygen to assist in their breathing, and adequate lighting when operating in the dark. This mode of operation may become the bottle-neck and key determinant of all rescue efforts.

During peacetime emergencies such as train or plane crash or multiple vehicle collision involving mass casualties, currently, casualty services would deploy ambulances from different stations to attend to and convey the casualties to hospitals. Treatment time could be delayed owing to the large number of casualties involved and pending traffic conditions for all the ambulances to reach the incident site and the hospitals. Stabilisation of the casualties' injuries, if not conducted quickly and in time, might result in loss of lives.

### SOLUTION

The SWIFT is specially designed to overcome these operational problems encountered by the Medical Platoon. With ease of deployment, the self propelled vehicle could quickly arrive at the incident site upon activation. The setup is done by two men and it requires 5 minutes for setup. Triage and treatment could as swiftly commence as the setup of the vehicle as this abbreviated period for the Medical Platoon to be operationally-ready is critical. Medical equipment and supplies are stored in a modular format which can be supplied prior to the incident to handle different disaster situations. In addition, with built-in lighting, oxygen, suction and water, it can provide better medical treatment for the casualties.

The advantages and values of the SWIFT are:

#### a Quicker Treatment Time and Enhanced Ability to save lives

As the setting up of SWIFT is mechanised, the time required is minimised allowing more time for the Medical Officers to attend to casualties. Key medical equipment is also made readily available for treatment of casualties. In addition, the medical supplies are stored in modular form to facilitate rapid replenishment and modification to attend to different types of incidents, such as casualties with burns or affected by chemical agents. These are critical to the success of any rescue mission.

#### b Creating the future

The SWIFT will have a central monitoring system to perform some of the tasks of measuring heart rate and blood pressure that are currently performed by the medical orderlies. With barcoding of the casualties, the accountability of

The frontal, side and back view of the vehicle, SWIFT

individuals will be enhanced. This system could be linked to the hospitals through wireless means, thus providing first hand medical information on the casualties to pre-empt the emergency departments of the injuries and necessary follow-up. This collaboration could lead to more lives being saved in a mass casualty incident. [http://www.healthstats.com.sg/cgi-bin/WB\\_Validator.pl](http://www.healthstats.com.sg/cgi-bin/WB_Validator.pl)

#### c Other professional usages of the SWIFT

The SWIFT could also be used by the military medical support for its troops. The ease and swiftness of deployment and redeployment of the SWIFT increase the mobility of the vehicle, appropriate for military purposes. Besides the army, the SWIFT could prove to be a useful tool for hospitals who require temporary A&E stations to attend to large influx of casualties.

### THE SWIFT

The SWIFT is a transport based system, which can be mounted on a truck or could be modified to be a demountable unit.

### THE COMPARTMENT

The compartment is supported by the vehicle and is able to store and carry medical supplies and equipment. Storage cabinets or containers are used to house these medical supplies and equipment and can be carried within the compartment. They are firmly attached to the compartment when the vehicle is moving. The attachments can be easily removed so that the cabinet or container can be positioned in the area of operation.

The side and end panels of the compartment are hinged to allow an opening to the enclosure of the compartment generated. Underneath the opened panels, personnel and equipment may be moved to manage casualties. In addition, on these panels, lights and medical services, such as oxygen and suction, are readily available for the treatment of the injured.

A water supply is required to connect the SWIFT for the water needed to clean casualties.

Centralised oxygen supply and suction are provided by 2 high powered oxygen concentrators (instead of oxygen tanks now), and vacuum pump suction enable 8 serious casualties to be treated at any one time. Water for washing is supplied through a 400 litre tank and a pump.

A generator is installed to generate sufficient power for the proper functioning of the electrical equipment.

### THE MONITORING DEVICES

The SWIFT is equipped with monitoring devices and a central station to record heart rate and blood pressure of casualties. To each moderately to seriously victim, a remote device (Mediwatch), like a wrist watch, will be attached. The device is able to determine the heart rate and blood pressure of the subject CONTINUOUSLY, as in ICU or OR, and transmit the information via radiofrequency waves to the central monitoring station, which in turn could be linked to the hospitals.

For further information,  
please contact

**SWIFT**

[cmting@healthstats.com.sg](mailto:cmting@healthstats.com.sg)



# The sights and



*Pic courtesy of Klaxon Signals*

**Kristian Johnson, Marketing Manager at Klaxon Signals, discusses the developments made in alarm warning systems and evacuation aids.**

be installed under proprietary heat and smoke detectors, a sounder and detector can be located at one point, saving time and materials. Low current fire alarm sounders are ideally suited for long cable runs where a low current draw is required.

Powerful disaster warning sounders have been specifically designed to provide fire alarm warning outdoors, particularly where a high ambient background noise is apparent. These units can have an output of around 140 dB @ 1 m making them ideal for the large industrial sites where they are often situated. Rugged by design, outdoor wide-area use sounders offer higher audibility to enable the sound to carry over large distances and they can offer the facility of voice/PA capability.

**IN LIGHT OF THE** impending DDA and EN54 directive, never before has it been more necessary to ensure safety and warning systems are up to standard. Perhaps of greater importance is making certain that the right system is specified for the right application, but the choice and versatility of alarm warning systems available in today's market make this no easy task.

**F**rom 32 tone interior sounders to wide area disaster signals, revolutionary directional sounders to state of the art desktop evacuation software; there is certainly no question that a system for everyone is out there, though the question of what and where is not so clear.

## EVOLUTION

In the UK, the vast majority of alarms rely on rudimentary warning systems, often using only simple bells or electronic sounders. Many of these basic products have now been developed into more sophisticated units offering superior audibility and a wider range of tones. Due to consumer demand, modern sounders have been designed to overcome the problems of high current consumption that were often found with early electronic sounders. They now draw less than a tenth of the power of their predecessors and many sounders are available with very low consumption, in the 3 mA to 5 mA range for outputs of around 100 dB(A).

Products for both indoor and outdoor use are now widely available with relatively high sound output and a wide choice of voltages, often incorporating up to 32 tones. Where a unit is required to perform in both indoor and outdoor

applications, appropriate weatherproofing is fitted. It is also possible for this type of multi-purpose product to be fitted with a beacon, should the need arise.

The introduction of multi-tone sounders as well as voice sounders has come some way towards addressing the need for alarms that are situation and even country-specific, whereby a tailored message can be emitted in place of a standard alarm tone. Many countries have their own specific, well-recognised alarm sounds and emergency evacuation signals, although this isn't the case in the UK. Products aimed at international markets need to, and more often than not do accommodate these differences to meet the localised needs of many countries.

Where voice-enhanced sounders are specified, they can provide the user with a clear and precise safety warning. User recordable sounders customise messages as well as allowing users to record multiple separate messages. These sounders are designed for use within the fire and industrial sector to enhance safety and security.

Many sounders are available on the market, including those designed principally as ceiling mounted units for use in fire alarm systems in areas with low ambient background noise. Intended to

## SEEING THE LIGHT

To meet the demands of the market many sounders have been further developed to take their capability beyond that of a basic audible warning device. Such products are now available in the form of combined multi-tone audible/visual units. Sounder-beacon combination units are a necessity in many applications. In a smoke filled area a guiding emergency light on its own is insufficient, and in high noise environments a sounder may not be heard. The majority of security systems rely solely on audible sounders, but often the ideal solu-



*Pic courtesy of Klaxon Signals*

# sounds of safety

tion should be a system that acknowledges the need for and incorporates sounder-beacon combination units.

Regardless of the type of sounder used the unit must be installed correctly to ensure maximum sound and light exposure. As sounders are designed to project a multi-directional sound, the centre of a room or wall is the most appropriate position for installation, though this may vary in areas with high noise hotspots. To check that the sounder can overcome any existing noise, background audibility should always be assessed before commencing installation. Sounders incorporating beacons must be visible to the eye; in contrast there are no real height issues with audible sounders. Naturally, the unit must be weatherproof if the sounder is to be installed outside.

High current consumption has been an issue long associated with beacon use, with xenon beacons often drawing excessive currents and most taking large current surges after each flash. This effect is often compounded when many units are used together: the cumulative effect can cause overloads in power supplies and sometimes disrupt other parts of the system.

It has been very important to find an alternative way to accommodate visual signalling. In security and fire installations, for example, low current consumption, reliability and synchronised beacon flashing is paramount.

Now beacons are available which use light emitting diodes as an alternative. LED beacons can produce light outputs similar to that of their xenon equivalents for currents of around 3 mA. This allows the user to integrate these units with sounders, lowering installation costs and finally making loop-powered sounder beacons a real option.

## TECHNOLOGICAL INNOVATION

Directional sounder technology is a further extension, which makes use of sound for evacuation rather than an alarm. New types of fire alarm sounders which use directional sounder technology to guide the occupants of a building to the emergency exits are helping to make escape easier. The new technology allows those with impaired vision, or any occupants of a smoke-filled building, to make a safer and quicker exit in the event of an emergency. As fatalities in fires are often caused by inhalation of smoke's poisonous gases, these sounders help to save lives by minimising evacuation time.



*Pic courtesy of Klaxon Signals*

Conventional fire alarm sounders, using narrow sound frequencies which the brain cannot localise, merely alert listeners to the presence of danger, giving no information concerning the distance from or the location of the nearest emergency exits, and therefore relying on occupants' ability to exit using signs only.

In order for exit sounders to be located by the brain, the frequency content of the sound has to be as wide as possible (20-20,000 Hz). Sounders using directional sounder technology emit a broadband, multi-frequency sound, commonly referred to as white noise, whose direction can be easily detected by the brain. Intuitively understood, a rising or falling tone indicates whether to descend or ascend any stairs.

Used in conjunction with modern analogue addressable fire detection systems which can determine the source of a fire, a preferred evacuation route can be set by triggering the appropriate directional sounders.

Emergency warning computer software is a further step beyond the realms of the traditional security system. Such software can enable orderly evacuations by transmitting tailored instructions and exit maps in front of each PC user exactly when they are needed; overriding whatever is displayed on the screen. The systems are designed to complement audible warning systems and can be configured to warn of fire, security and other hazards. They can also be used to call individuals to help, such as fire or evacuation wardens.

If fire breaks out and a building's occupants need to evacuate, such systems can display maps, assembly points, sounds and animations to aid a swift and orderly exit. The programs can also be customised to display other messages for any need,

such as those to alert First Aid personnel to an incident within the building, or to summon security staff discreetly.

## LEGISLATION

Legislation plays a key part in keeping sounders and security/safety systems up to date. For example the Construction Products Directive states that all fire sounders sold in Europe after June 2005 will have to comply with EN54. The impact on businesses in terms of time and costs required for product testing, approvals and amendments is as yet unknown, but the impact is certainly expected to be significant.

The Disability Discrimination Act (DDA), which should be in place in the UK by October 2004, will have a massive impact on all businesses regardless of trade or industry. It will require modification, or in some cases a complete overhaul, of many premises in order for them to be compliant with the act, with security systems falling within the guidelines. Products incorporating directional sounder technology already acknowledge the need for security systems that cater for all, regardless of disability. An obvious example is the way in which visually impaired people can be guided away from danger zones by white noise generated by directional sounder technology. Visual warning systems also adhere to the DDA's guidelines by offering guidance to the hearing impaired. Sounder-beacons can cater for many situations by offering both audible and visual warning.



# 2004



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# Fire and Rescue Training







# The Fire Safety



## 1 INTRODUCTION TO THE COLLEGE

- 1.1 The Fire Safety Engineering College is a private joint stock company owned by a consortium of sponsors. It is registered with the Ministry of Commerce and Industry and registered with and regulated by the Ministry of Higher Education.
- 1.2 The College's objectives are:
  - 1.2.1 To create in the Sultanate of Oman a cost effective international centre of excellence for the study of Fire Safety Engineering for public and private students from the Sultanate of Oman, the Gulf Region and beyond.
  - 1.2.2 To create in the Sultanate of Oman a cost effective international centre of excellence for the study of Oil and Gas Drilling for public and private students from the Sultanate of Oman, the Gulf Region and beyond.
  - 1.2.3 To provide a progressive system of education and training so that student fire engineers are able to achieve appropriate vocational and academic qualifications leading to local awards at Certificate and Diploma levels and to the award of degrees and higher degrees in the United Kingdom.

- 1.2.4 To provide a progressive system of education and training for oil and gas drilling personnel so that drilling personnel at all levels are able to achieve appropriate vocational qualifications and progress to programmes of Higher Education.
- 1.2.5 To introduce additional programmes as required to meet the Sultanate's needs for a qualified work force, to meet the requirements of the Ministry of Higher Education, and to further the College's professional and business objectives.
- 1.3 The College brings together the best purpose built facilities and staff for fire safety, oil and gas drilling training and education within the Gulf Region and is one of only a few such establishments world wide.

## 3 COLLEGE RESOURCES

### 3.1 General Facilities

- 3.1.1 The FSEC is located on a 100 acre site leased from the Director General for Civil Aviation and Meteorology and is close to Seeb International Airport.

The site includes a main teaching and administration block, a fire station, stores, workshop, prayer room, shower and ablutions as

well as a lagoon and state of the art realistic fire and rescue training rigs for civil defence, aviation and industrial fire services.

The main building and portacabin annexes seat approximately 300 students in a total of twenty classrooms and are equipped to enable the tutor to offer the very best in presentation technology. Four additional classrooms accommodating 120–150 students are ready for occupation from February 2003. Plans for a new teaching block comprising additional laboratories, lecture halls, staff accommodation, an examination hall and a multi-purpose hall are currently with Muscat Municipality for approval.

- 3.1.2 During the working day, a dining room on the ground floor provides hot meals, drinks and snacks. All classrooms and movement areas are fully air conditioned. Male and female toilets are located on the ground floor and chilled drinking water is available on all floors and at outside areas.
- 3.1.3 The main building also provides reception and administration offices, with separate offices for senior staff, whilst teaching Staff are located in a large open plan workroom. A reception area inside the main entrance provides a central focal point for students and visitors and also acts as an information centre.
- 3.1.4 A number of buildings have been built around the campus to house support facilities. These are:
  - A fully air conditioned changing room with locker, shower, drying and toilet facilities.
  - Stores block where foreground equipment is stored and serviced.
  - Fire station to meet the demand for training and engineering demonstrations (the FSEC has a fleet of eight fire fighting vehicles which are kept under cover)
  - Workshop and charging facility to maintain the FSEC's Breathing Apparatus equipment and cylinders.
  - There is also a prayer room.

# Engineering College



3.1.5 Because of the nature of the training, large amounts of water are required. To enable the demand to be met, water is supplied via a 600mm main to a tank with a total capacity of 150,000 gallons. In addition, a three million litre lagoon has been constructed to supplement the main supply. A water well has been drilled on site with an extraction permit of 62000 litres per day.

## 3.2 Practical Teaching Facilities

A great deal of research and study has gone into the provision of equipment and buildings which will enable the FSEC to achieve its objectives. Currently, there are a number of steel rigs, purpose built structures and demonstration facilities. These are aimed at providing the student with up to date technical, practical and realistic fire fighting training and to provide practical examples of fire engineering problems. Four specialist areas of fire fighting are catered for:

Aviation Fire Fighting  
Fire and Rescue  
Industrial and Commercial  
Well Engineering.

### 3.2.1 Aviation Firefighting

- Real fire simulation facilities

include a full size steel reproduction of a large passenger aircraft with fuselage compartment, wings, engines and undercarriage. Internally the fuselage is fitted with twin aisle seating, a cockpit, galley and toilet. All are fitted with real fire scenarios. This mock up will train aviation fire-fighters and engineers for every eventuality concerning passenger aircraft fires and disasters and is one of the largest and most comprehensive of its type in the world.

- There is also a full scale steel reproduction of a large helicopter. Fire scenarios are located internally, in the engine compartment and the rotor head.
- There is a full scale steel reproduction of a military jet fighter. This type of aircraft presents its own peculiar dangers when in a crash situation. The facility provides a learning environment to enable the student to understand the unique problems of military aircraft.
- A large investment has been made in the provision of three specialist aviation fire fighting vehicles designed to the FSEC's own specification.

These vehicles are at the leading edge of aviation fire fighting technology and assist in both vocational training and in the practical demonstration of hydraulics and other fire engineering subjects.

### 3.2.2 Fire & Rescue

- To enable students to understand fully the problems associated with building design and management from a fire safety point of view and to deal with specific fire scenarios, specially designed buildings have been or will be constructed. They are unique in this part of the world and they can be used in a wide variety of ways.
- A smoke chamber, built on three floors has been designed to provide instruction on design aspects of the control and management of smoke in buildings, and advanced training for fire-fighters in working in smoke, darkness, heat and humidity. The internal layout can be altered so that the students do not become familiar with the arrangement. The building can be smoke logged using a smoke generator which produces non toxic smoke. In the event of an emergency a powerful ventilation system has been installed which will clear the building of smoke in under thirty seconds. Externally, the facility offers a number of platforms from which different types of rescue techniques can be rehearsed.





# The Fire Safety Engineering College



- One of the most serious fire situations that can develop in modern closed buildings is a flashover or backdraught. This type of fire is becoming more common and is very explosive, destructive, and very dangerous both to building occupants and to fire-fighters. FSEC has developed and constructed a simulator which recreates the flashover phenomenon repeatedly. It will enable students from both engineering design and operational fire fighting backgrounds to understand the fire dynamics involved.
- A fleet of modern fire fighting vehicles have been purchased to enable the practical study of both hydraulics and operational techniques. Students will also be able to practice command and control procedures with the use of multiple vehicles and their crews.
- The modern day fire-fighter is increasingly involved in the rescue of persons from crashed motor vehicles. To train for this eventuality the FSEC has constructed a section of highway which is located close to the fire training area. Various vehicles are positioned on this to represent road accident scenarios. Fire-fighters are given the opportunity to practice different types of rescue techniques. In addition the facility is used to demonstrate the problems which can occur with vehicles carrying hazardous materials.
- A Multi-purpose Multi Scenario "Fire House" has been designed. The building will occupy an area 60 m x 60 m with additional hard standing to allow free movement of vehicles. One half of the building will be five floors high and will enable students to train

for fires which occur in high rise buildings. The internal arrangement can represent a small warehouse, shopping mall, airport terminal, offices or a residence.

This type of building will serve its purpose well into the twenty first century as it can be adapted to represent any building in any emergency situation. It will be used to teach good building design, smoke control and the use of sprinklers and automatic fire detection systems in engineering modules.

## 3.2.3 Industrial and Commercial

The major industrial activity in the region is that associated with gas, petroleum products and other chemicals. The potential for disaster is therefore high. Good design, good management practice and sound planning mitigate the risk considerably. The demand for training in each of these areas has, until now, been met by institutions outside the Gulf Region. The FSEC is equipped with a state of the art facility to provide this highly specialised training. The refinery complex can be used both for



Fire Engineering education and/or operational fire fighting techniques.

- The refinery complex occupies a site of 10,000 square metres. It consists of three levels with a petrochemical process plant and oil cracker unit, tank storage facility and tanker filling depot. In addition a number of pipe and valve gantries are located around the rig which are incorporated into different scenarios. All fires are fired by LPG.
- Concern for the safety of students the fuel supply to any part of the refinery can be isolated virtually immediately by the operation of dedicated safety valves.
- The refinery complex can be used to simulate, stack fires, flange fires, burst lines, cargo pump fires, pipe line fires, and fires in and around storage tanks. These can be simulated on all levels of the refinery either as single incidents or as full process unit fires. There is also a chemical storage area as well as the capability to simulate oil line fractures in ground and overhead pipelines. The overhead pipe lines are pressure fed and are fitted with full size process valves which can be used to demonstrate all forms of fires involving valves such as packing fires, stem fires and, also, valve splitting fires.
- The tank farm consists of six storage tanks which can be used either individually or collectively to create full tank surface fires. The tanks can also be used to simulate a tank being overfilled. These 5 metre high storage tanks are connected by gantries to allow high rescue training.
- There is a full size pipe trench within the tank farm where training for fighting fires in pipe lines can be carried out. There is also a facility for confined space rescue and Hydrogen Sulphide training. The road loading terminal has room for two full size tankers and can be used to simulate a terminal fire or fires in the road tankers themselves. In addition to these many realistic fire safety and fire fighting scenarios the refinery complex can be used for pollution control training.

- Two other rigs have been provided; a split pipe flange and a vertical screen to demonstrate the problems associated with fires involving free flowing products.
- Liquefied Natural Gas (LNG) is now a major industrial fuel source and by the year 2010 will be a major part of the economy of Oman. The FSEC has installed a dedicated facility which will demonstrate to employees and fire-fighters the characteristics and dangers associated with LNG in both free and process environments.
- The Fire Safety Engineering College believes that it has designed and built the most comprehensive and advanced refinery fire safety and fire fighting simulations in the Middle East.

### 3.2.4 Well Engineering

Moving upstream, the Fire Safety Engineering College in co-operation with a consortium of representatives of the Sultanate's Oil and Gas Industry has drilled a training well (TRAINWELL) to provide realistic training for all the functions and levels needed by the drilling industry.

- As elsewhere throughout the world there is a greater than ever level of concern about the need for the oil and gas drilling industry to train. Chronic reliance on the industry giants to provide the skilled workforce needed, the accumulative impact of layoffs, the age profile of the industry (the average age on the North Sea rigs is said to be 47), over dependence on expensive expatriate labour, the requirement to meet nationalisation targets, wastage rates in professional examinations, and the arrival of gradu-



ate entrants without field experience have all now come together to create a new impetus for systematic training within the industry.

- Courses include rig operations, rig maintenance, rig safety, basic and more advanced fire control, fire and explosion hazard management, working with breathing apparatus, confined space working, well control, well control refresher, advanced well control, horizontal well control, stuck pipe, first aid, manual handling, health, safety and environmental management. Where appropriate, courses will be accredited by the WellCap and Rig Pass programmes of the International Association of Drilling Contractors and the International Well Control Forum.
- This unique partnership between the Oil and Gas Drilling Industry and the Fire Safety Engineering College, which is industry led, is producing training courses which bring together competence in Drilling, Fire Safety and

Firefighting, and Educational Technology.

### 3.3 TRAINING EQUIPMENT

- 3.3.1 Breathing Apparatus plays a very important part in the instruction of fire engineering and practices. The FSEC has thirty sets of breathing apparatus and sixty cylinders. A high volume air compressor has been installed which will charge eight cylinders in six minutes. Classroom teaching is aided by the provision of a rail 'teaching wall' system incorporating white boards, angled screen, flip charts, television monitor and video player, and a state of the art computer media presentation system.
- 3.3.2 Fire Safety Engineering College standard format student notes are issued to cover each of the objective areas included in the course programme. Each course is supported by a range of visual aids, e.g. overhead transparencies, computer generated power-point presentations and videos. All equipment necessary to support the training being offered is available either from fire fighting stocks currently held by the Fire Safety Engineering College, new purchases to satisfy requirements or in some cases will be hired in as required (e.g. craneage)



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# PRODUCT PROFILE



## HALE PRODUCTS EUROPE

### Innovation In Action

**H**ale Products Europe is one of the world's leading providers of specialist fire fighting equipment. With extensive manufacturing facilities in the United States and Europe, and distributors throughout the world, HALE produces truck mounted, trailer mounted and portable fire pumps. HALE is the home of the internationally recognised GODIVA brand of fire pumps, which are to be found in service in more than 100 countries. HALE is an *independent manufacturer* with decades of experience in fine-tuning products at the heart of the life-saving business. Hale also produce the Typhoon range of positive pressure ventilation fans.

As a leading manufacturer Hale Products Europe are always pursuing new product developments for firefighters worldwide. Some of the latest innovations are –

#### World Series Multi-pressure Pump

The Godiva World Series vehicle pump is proving a popular replacement for the previous GM Range, itself a leading pump



World Series pump with Integrated CAFS

which has given many years of service to firefighters throughout the world. Key innovative features of the World Series include:

- Completely new design introduces improved efficiencies with robust construction
- Full compliance with anticipated new CEN standards
- Optional control panel – incorporating *Class 1* instrumentation
- Self-cleaning filtration system
- New automatic thermal relief and internal pressure relief systems
- Low pressure water available to side hose-reels as a standard feature
- More compact design envelope and reduced weight
- Conforms to DIN and International standards as required
- Light alloy and gunmetal versions
- Significantly reduced scheduled maintenance requirements
- Warranty extended to 2 years

The latest innovation for the World Series pump is the all stainless steel version, which was recently introduced to the US market at the Fire Rescue International Show 2003, Dallas. Stainless steel provides the pump with life long corrosion resistance and a guarantee of low maintenance costs.

#### Compressed Air Foam Systems

The superior firefighting power of Compressed Air Foam systems is increasingly recognised. Hale has been a leading developer of CAFS technology for many years, and can now supply a range of integrated engineering solutions designed to

complement the equipment inventory of any service. The range provides a variety of installation options from OEM to retrofit and stand-alone, self-contained systems.

#### World Series Pump with Integrated CAFS

In this configuration the CAFS unit is a compact package attached to the rear of the World Series pump “piggy-back” style, it comprises of a compressor, Hale Foam-Master V series foam induction unit and Hale X-Mixer system. A solid-state electronic control provides a safety system and full operator control is provided at the pump control panel.

#### MiniCAFS

A self-contained, retro-fittable system, assembled within a rigid frame, which will fit, into the space required for an 8 kVA generator. The foam mix rates for Class A fires are as low as 0.1% – 1.0%, resulting in more efficient application of water and personnel, faster knock down times, reduced water and environmental damage. Water is supplied either by vehicle pump or portable pump, without any requirement for modification.

#### Power flow 8/5 Compact Portable Pump

The latest version of the Power Flow 8/5 Compact is now the highest performing yet most compact portable pump in its class. It is also one of the quietest pumps available providing a discharge of 800 l/min at 5 bars. Key features include exhaust gas ejector or hand priming versions, electric start as standard with hand start back-up, wrap around stainless steel frame and a compact, lightweight design.

#### Class 1 Range

Hale are also providers of electronic instrumentation and control equipment from their sister company in the Index corporation – Class1 Inc. of Ocala, Florida.

The latest products include Smart Programmable Switch panels and the “Command Master” – a complete pump and engine control unit.

For more information, please contact:

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# THE FIRE SAFETY ENGINEERING COLLEGE

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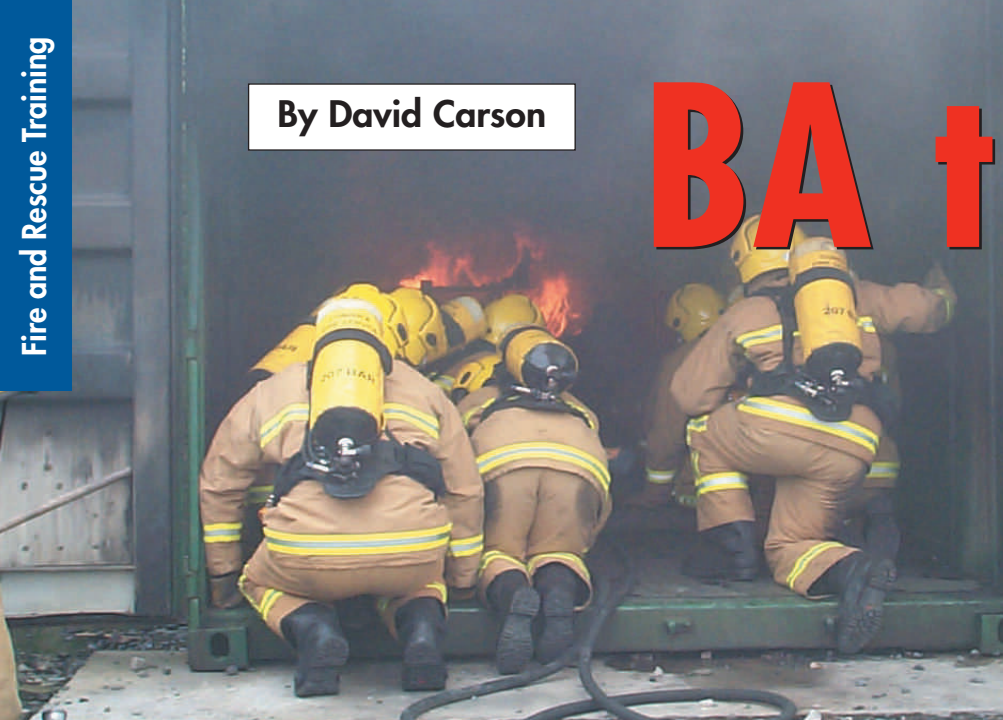
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By David Carson

# BA training



*Pic courtesy of The Fire Service College*

it's ultimate effects and any relevant learning points that can be gleaned for future use. By this method the classroom and practical based learning can be compared to and reinforced by such studies. Students, acting within syndicates, are required to make a formal presentation based on a 'case study', which they have selected, so that any learning points can be highlighted. Part of the course requires students to submit a two thousand five hundred word assignment on any topic concerning fire behaviour. Individuals can select a case study of an incident, which has occurred within their Brigade, for this assignment.

## BA TRAINING AT THE FIRE SERVICE COLLEGE

The Fire Service College, based at Moreton in Marsh, Gloucestershire, England, offers a wide variety of fire-related courses. BA training forms a major part of these courses, in particular BA Instructor, Hazardous Material and Environmental Protection and Fire Behaviour Training Instructor. In the past few years a large number of students from the Asia and Pacific areas have attended the College for such courses. In addition, College instructors have visited countries to provide on-site advice on how similar courses can be prepared, accredited and managed at local training centres.

The facilities available at the College are second to none within the United Kingdom and can provide realistic training scenarios for a wide variety of incidents: air, sea, rail, road, high rise, off-shore, commercial, domestic, industrial, domestic, environmental... to name just a few. College personnel are drawn from Fire Brigades throughout the United Kingdom and bring to the College a wealth of experience and knowledge. The learning environment fostered by the College ensures that these personnel are able to develop their chosen areas of expertise through study and research. A number of areas relating to the development of BA training are currently being investigated. For the purpose of this article these developments will be tied into the Fire Behaviour Training Instructors course.

### FIRE BEHAVIOUR TRAINING INSTRUCTORS' COURSE

The Fire Behaviour Training Instructor course lasts for two weeks and was developed five years ago, drawing upon experience and expertise from throughout the world. The course is designed to ensure that a balance is struck between theoretical and practical knowledge. In particular emphasis is placed upon the 'instructor

element of the course. To this end the trainee instructors are required to acquire a high degree of technical knowledge which they can combine with the experience and competence gained in the realistic conditions achieved on the course. Time is spent in the excellently equipped chemistry laboratories studying the science of combustion, pyrolysis, limits of flammability, flashover, backdraughts and fire-gas explosions. As much use as possible is made of small-scale demonstrations. Equipment used includes 'Aquariums', 'Bang Boxes' and 'Wendy Houses'. Students are required to present a number of lectures on Fire Behaviour thereby demonstrating their grasp and understanding of the theory and their ability to successfully use the laboratory equipment.

Another area of the course that has been developed is the use of 'case studies'. There is concern throughout the UK Fire Service that Fire Behaviour Training is not being effectively applied to actual operational incidents. The College library holds hundreds of reports on fire incidents, which have occurred in the UK and the rest of the world. College instructors and students can use these reports and the photographs that they contain to try to ascertain the likely fire development,

### HEALTH AND SAFETY

In recent years more emphasis is being placed upon the command and control of BA at operational incidents. This is mainly due to injuries caused to operational personnel at incidents where the control of BA wearers has been found to be inadequate. The United Kingdom Technical Bulletin 1/97 on BA Command and Control provides guidance on the above. Training at the College emphasises, to student incident commanders and team leaders, the importance of proper command and control and the need for the correct command structure to be implemented at the earliest stages of any incident involving the use of BA. Another tool available to the Incident Commander is Dynamic Risk Assessment. The use of a simple flow-chart can help the Incident Commander to continuously determine the potential risks and benefits of their actions and so develop a suitable course of action and the necessary safety measures required to implement it.

It is possible that some deaths at fire related operational incidents have been due to a lack of understanding and the inability to recognise the symptoms of fire development. Understanding the risks imposed by fires and the possible consequences helps the Incident Commander to assess the safety control measures required. For this reason Fire Behaviour sessions have been developed for inclusion in a number of courses undertaken by the College. These sessions are of particular relevance on the core development courses such as Crew and Watch Commander and Junior Officer Advancement.

An area of increasing concern within the British Fire Service, particularly in Fire Behaviour Training is the health monitoring of instructors and students. Recently there has been a lot of medical research into the short and long term health

# for fire-fighters

hazards of repeated exposures to high temperatures. The guidance that such research has produced suggests that prior to BA training of any type, students and instructors should be fit, sufficiently hydrated, adequately rested between training sessions, free from any illness and not taking unsuitable medication. Fire Behaviour Training instructors should also complete weekly and monthly health surveillance logs. These provide Health Advisors with a clear indication of the type and duration of any 'hot' BA wears and give early warning of any unusual health problems that the instructor may be developing.

## PPE

In recent years there has been a dramatic change in the Personal Protective Equipment available to fire fighters. The thermal protection afforded from fire tunics and leggings, flash-hoods and gloves has increased. Using temperature probes within the Fire Behaviour Training units, it is not uncommon to record temperatures of approximately 700, 500 and 250 degrees centigrade at head, chest and waist height respectively. Less than a decade ago it would have been unimaginable for fire fighters to endure such conditions for more than a few seconds without suffering extreme discomfort or burns. With modern PPE the level of protection afforded means that such temperatures can be endured for several minutes at a time without immediate stress. One drawback of such superior protection is that fire fighters may become more isolated from their surrounding conditions. They can therefore, due to greater exposure, be at more risk of injury, should conditions rapidly deteriorate. This is especially relevant operationally where fire fighters can be lulled into a false sense of security. College instructors therefore try to ensure that a correct balance is struck between exposure to

realistic fire conditions and the risk of injury, however minor. The old adage of 'burn to learn' should definitely be a thing of the past. It is important that students learn, through theory and practical experience, to recognise the likely outcome of fire development and learn to use their senses such as sight, sound and temperature to help gauge this development and therefore act accordingly.

Another drawback of greater thermal protection is the risk of self-induced heat stress when working hard particularly within a BA environment. Most British Brigades only issue one type of fire kit, which must be used for all types of incident. For the majority of these incidents high thermal protection is not required. Breathable fabrics can alleviate the problem of heat stress however, these can be quickly over-run if the individual is working hard or the fire kit is dirty. As mentioned above, heat stress can lead to a variety of short and long term health problems and should be avoided where possible. The College is assisting in the evaluation of various pieces of PPE and is also attempting to ascertain what is the optimum level of PPE to be worn by Fire Behaviour Training Instructors to prevent health problems. Areas under investigation include: the number of layers of clothing being worn under PPE and the use of hoods on fire tunics to protect the head.

## FIRE BEHAVIOUR TRAINING UNITS

The College possesses six Fire Behaviour Training units including two flashover demonstrators, two 'attack' units and two 'window' backdraught units. All the units use carbonaceous fuel in the form of chipboard. The units have been converted locally using standard shipping containers as the base. It is felt at the College that only carbonaceous units can provide the real characteristics of fire development and behaviour. Gas training units have



the advantage of being environmentally friendly and able to cope with a large throughput of students but do not provide the necessary realistic conditions. They are better used for practising water application techniques once students have had ample opportunity to observe fire behaviour and practice suppression techniques within the more realistic environment of a carbonaceous unit.

There are health concerns with the type of carbonaceous fuels being used inside containers. Chipboard normally consists of wood particles contained within a plastic matrix. The combination of wood and plastic provide a good mixture of fire gases and thick smoke with which to demonstrate fire development features such as the 'neutral plane', fire gas balloons, roll-overs etc. Unfortunately, the downside of using any plastic is the potentially adverse health effects that the products of combustion can cause. Following a report, produced by a UK Fire Brigade, highlighting these concerns the College has decided to monitor the situation. Some Brigades within the UK already prohibit the use of chipboard and will only allow untreated timber to be used. Others have adopted a variety of safety measures to reduce the risks posed.

## PROGRESSING FROM SINGLE CONTAINERS

Within the UK there is growing concern that the development of FBT is stagnating and not moving forward from single container units. Several Brigades have designed and developed multi-compartment fire training facilities using containers. These give them the opportunity to reproduce and simulate a variety of scenarios for a low initial set up cost. The College already has a number of concrete structures, designed primarily for small carbonaceous crib fires, which could be

*With modern PPE the level of protection afforded means that such temperatures can be endured for several minutes at a time without immediate stress.*



## BA training for fire-fighters



*Pic courtesy of The Fire Service College*

adapted to provide realistic fire behaviour training. They have been used for such in the past, but high fire loading and the method of setting the fire was causing unacceptable damage. College FBT instructors are now investigating methods of building fires to give the right level of realism within these buildings without such damage.

### TACTICAL VENTILATION

The College has a strong background in tactical ventilation. At present it runs a one-week course for Tactical Ventilation Instructors. Most courses such as FBTI and core progression also receive at least a half-day input on tactical ventilation demonstrating the principles and practical application of Positive Pressure Ventilation. The College is looking to develop the integration of fire behaviour and tactical ventilation within a suitably realistic training environment.

### BRANCH DESIGN

There is an on-going debate, between various fire departments, on the most suitable design for a general-purpose fire-fighting branch. At the Fire Service College the general consensus is that a branch should be capable of producing a variety of streams ranging from fog through a spray to a solid jet. For a small compartment fire, it is widely believed that a 30-60 degree cone, producing a fine fog of water at a flow rate of approximately 100-150 litres per minute is suitable for the control of fire gases. Traditionally, British fire fighters normally carry out an initial attack on a fire using a hose reel. This consists of a 19 mm hose with a small branch operating at approximately 20 bars. It was quickly discovered at the College, when the new pulse techniques were introduced, that most branch

and coupling designs were inadequate for the task. To operate smoothly at 20 bars and to give a pulse of short duration, it has been found that a branch with a slide design has distinct advantages over a ball valve. The water hammer produced by pulsing a branch can easily burst couplings or damage pumps. Macdonald couplings with a screw-down lock facility produce a strong and secure option. The College has provided advice to a number of branch manufacturers on branch design requirements. One such piece of advice is that, ideally, within the cone there should be an even distribution of water rather than just at the rim. This would ensure that there is an optimum spread of small water particles to absorb heat and control the fire gases.

### THERMAL IMAGE CAMERAS

There has been little development by most Brigades into the operational use of Thermal Image Cameras (TIC). A TIC is not always considered when making an initial entry despite its proven ability to provide significant assistance in quickly locating casualties and/or the seat of the fire. Reasons cited, to name a few, include a lack of faith in reliability, concerns over intrinsic safety and resistance for moving away from traditional, proven search procedures. The latest generation of TICs however, provide an excellent and versatile search tool. They can produce coloured images showing temperature variation, take digital stills thereby preserving forensic information before it is altered by the developing fire situation and can send live images via telemetry to the Incident Commander. The latter gives the Incident Commander valuable information on the fire's development and assists in the dynamic risk assessment and the continuous evolution of an operational plan.

Various College members feel that this is an area of BA training that requires development. It is hoped, should support from manufactures be forthcoming, that this can be investigated and pushed forward. It is interesting to note, from an Australian CFBT web site, that TICs are being used to record and study the nature of flash and roll-overs.

### BA TELEMETRY SYSTEMS

The College uses the Draeger 94 plus Breathing Apparatus set fitted with the Bodyguard combined pressure gauge and Distress Signal Unit system. This set has proved itself to be reliable throughout all the use it has been subjected to. Its main drawback is that Bodyguard is a complex system and needs constant practise in its use to ensure that the general and daily safety checks are carried out correctly. With the regular turnover of students at the College, who are from a variety of backgrounds and possess a wide range of BA experience, the College has realised that it is not always possible for sufficient instruction and practice time, for the correct use of the Bodyguard system, to be given. The College has therefore modified the general safety check so those students can carry out the full range of required tests without incorporating all of the Bodyguards features. BA wearers who are competent in the use of Bodyguard can carry out the checks as normal.

Draeger has recently developed the PSS Merlin BA Entry Control Board, which compliments the Bodyguard system. The Merlin Board uses telemetry to communicate directly with the Bodyguard unit via an attached radio unit. This allows the BA Entry Control Officer to interrogate the Bodyguard unit to establish cylinder contents, air consumption rate, time to whistle etc. The Merlin Board also has the ability to calculate Time of Whistle. Should the Incident Commander require all or part of the BA crews committed to the risk area, to be evacuated, then an evacuation signal can be transmitted via the Merlin BA board to the Bodyguard unit. Obviously, from an incident command point of view, Merlin has the ability to provide the Incident Commander with up to date information to assist them in making decisions and to be another valuable safety tool in the control of BA. It is expected, within the near future, that Draeger will make a Merlin board available for the College to assess and to incorporate within the training programme. It would be of particular use for the BA Instructors course where its capabilities could be tested to the full.

### In Conclusion

There are a number of areas within BA training that can and should be developed. It is felt that the College has the facilities and expertise to play an active role in any such development.

# International Training Standards

By Bill Savage  
Head of Aviation Training, FSEC

Pic courtesy of FSEC

THE INTERNATIONAL CIVIL AVIATION ORGANISATION was established at the Chicago Convention in 1944. The convention was the result of the coming together of most developed states having an air transport industry to establish standards and principles for the safe, efficient and orderly operation of international air transport. Standards and recommended practices are laid down through a series of "Annexes" which cover all aspects of international air transport. Standards and recommended practices for aerodromes were first adopted in May 1951 being designated "Annex 14". It is within this annex that the international requirements for rescue and fire-fighting services at airports are set out. In the context of training the Introductory note on rescue and fire-fighting is significant stating:

"The principal objective of a rescue and fire-fighting service is to save lives. For this reason the provision of means of dealing with an aircraft accident or incident occurring at, or in the immediate vicinity of an aerodrome assume primary importance because it is within this area that there are the greatest opportunities of saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following an aircraft accident or incident, or at any time during rescue operations.

The most important factors bearing on effective rescue in a survivable aircraft accident are: the training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and fire-fighting purposes can be put into use.

Requirements to combat building and

fuel farm fires, or to deal with foaming of runways, are not taken into account".

It is significant that of the three most important factors bearing on effective

rescue in a survivable aircraft accident *the training received* is listed foremost. The annex goes on to advocate under *Personnel*: (9.9.30)

*"All rescue and fire-fighting personnel shall be properly trained to perform their duties in an efficient manner and shall participate in live fire drills commensurate with the types of aircraft and type of rescue and fire-fighting equipment in use at the aerodrome including pressure fed fuel fires."*

ICAO Recommends (9.2.31). *"During flight operations, sufficient trained personnel should be detailed and be readily available to ride the rescue and fire-fighting vehicles and to operate the*



Pic courtesy of FSEC





Pic courtesy of FSEC

equipment at maximum capacity. These trained personnel should be deployed in a way that ensures that minimum response times can be achieved and that continuous agent application at the appropriate rate can be fully maintained. Consideration should also be given for personnel to use hand lines, ladders and other rescue and fire-fighting equipment normally associated with aircraft rescue and fire-fighting operations".

ICAO gives guidance on training requirements in Attachment A, Section 16 of the volume, the *Airport Services Manual Part 1* and in its *Training Manual Part E -2*.

It is clearly evident that ICAO places considerable emphasis on training, contending that training underpins the effectiveness of the rescue and fire-fighting service at the scene of an aircraft accident, and goes on to offer guidance on such training, advocating that all rescue and fire-fighting personnel be properly trained. Why is it then that these training requirements do not figure significantly at airports throughout the world, or the interpretation of such requirements differ so markedly from one country to another. ICAO has a judicial function to consider disputes involving the interpretation or applica-

tion of the convention or its annexes. It may impose penalties against a country or airline by way of the withdrawal of voting rights or the imposition of a fine. It also rules on any complaint as to preferential treatment, which may be given to a particular airline. It ensures for example, that entry requirements for one country are applied in the same way to all aircraft entering that country. It harmonises the requirements for the registration of aircraft, equipment and associated operating facilities. **However ICAO has no direct power within individual countries**, and indeed, countries are not obliged to accept all ICAO requirements, although there is a presumption they will comply unless a notification of exception is filed. In order therefore to ensure that international regulations are applied, each country has its own national aviation executive. For example, in the United Kingdom it is the Civil Aviation Authority; in the USA, the Federal Aviation Administration; in Oman, the Director General of Civil Aviation & Meteorology, and in the UAE (Abu Dhabi), the Department of Civil Aviation.

It is evident that International standards and recommended practices for RFFS at aerodromes are generally complied with where there is strong regula-

tion and inspection, usually by a Civil Aviation Authority or similar Government arm which ensures compliance. Compliance is also more judicious and robust if international standards and recommended practices are incorporated into domestic legislation as in the United Kingdom and the United States. This makes the International requirements mandatory in terms of countries meeting their own indigenous legal obligations for aircraft rescue and fire-fighting provision. However, interpretation of international standards by countries and their adoption into domestic legislation can bring about variations in certain aspects of rescue and fire-fighting provision between one country and another although fundamental prerequisites are invariably included. This is altogether another issue for future discussion.

In most developed countries aircraft rescue and fire-fighting personnel are trained to international standards and hold certificates of competence at various levels. Normally, in these countries, RFFS personnel are not being allowed to "ride" – form part of the rescue and fire-fighting crew at an aerodrome, without a certificate of competence. In developing countries this is generally not the case where the emphasis is generally on localised training for RFFS personnel. It is usually officers from such countries, who receive training to international standards, predominantly at overseas locations. These officers will then usually become responsible for the training of RFFS personnel. They will have little or no practical training experience, with very limited access to facilities, particularly practical facilities, aircraft simulators, pressure fed fuel fires, a breathing apparatus chamber, firescreen and so on. There is an indisputable gap in the approach to RFFS training and the levels of competence of RFFS personnel in developed and devel-

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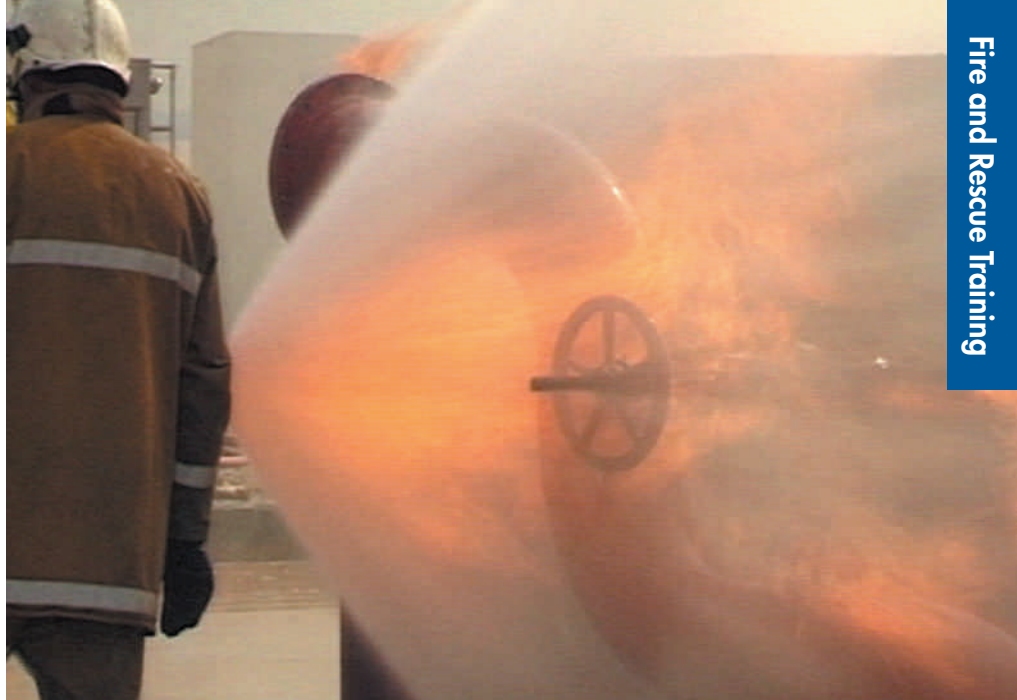
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oping countries, which predominantly goes unnoticed. It is only when an aircraft accident occurs and the attention of the entire world is drawn to the accident site and searching questions are asked during the subsequent investigation, that prevailing standards of rescue and fire-fighting provision at an airport, together with all other aspects of safety, become exposed.

It is manifest that in developing countries there will be pressing demands on limited resources, which focus the attention of Government Ministers and those, responsible for the interests of the nation. In terms of a developing country's ability to meet its national and international commitments, RFFS at airports together with the associated resources needed, will be amongst the issues liable to be ignored whilst more pressing matters are addressed. This perspective generally sees the RFFS at airports lacking resources and more importantly the expertise and understanding to use what limited resources and equipment is available to best effect. This latter point is crucial for although resources and equipment may be limited well-trained personnel who can utilise what is available to maximum effect may have a positive chance of being successful at the scene of an air-



*Pic courtesy of FSEC*

craft accident/incident. When aid to developing nations in the form of RFFS resources and equipment is provided, personnel tasked with their introduction often do not have the knowledge or basic understanding to instruct or enlighten fire-fighters on its correct use, or methods of operation. Untrained RFFS personnel endeavouring to determine modes of operation of crash fire

rescue vehicles have, on occasion, reduced an appliance's operational serviceability to a minimum. More commonly, sophisticated operating functions and operating safeguards built into an appliance quickly become ineffectual, reducing systems to manual modes of operation, merely because basic understanding and knowledge were lacking. I have seen sophisticated equipment

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Pic courtesy of FSEC

donated by well-meaning fire services lying idle, being unemployed and collecting dust for the want of the expertise needed to introduce it into operational service. Conversely I have seen such equipment introduced incorrectly, with an outcome that a risk to the safety of RFFS personnel tasked with its use has been generated.

From any standpoint, personnel undertaking any form of employment must be trained and competent to undertake the duties and responsibilities for which they are liable to be tasked. Surely this is fundamental when personnel are liable to be tasked with saving the lives of others. Training RFFS personnel to a level of competence where they are operationally effective and capable of working satisfactory in a team is not complex. Training at this level fundamentally revolves around the practicalities of fire-fighting, hose running, ladder drills, knots and lines, hot fire training, breathing apparatus training, search and rescue and so. Once basic skills are established these may be incorporated in combined drills used to develop sound operational tactics and techniques, which ultimately enhance the

utilisation of appliances and equipment.

In the Gulf Region and other countries where teaching difficulties associated with language and interpretation are likely to be encountered the "hands on approach" to training practical skills greatly assists students to grasp fundamental concepts. Fire-fighting is fundamentally a practical skill demanding sound practical ability, robust physical fitness, self-determination and motivation. What is probably more difficult to overcome is the burning desire of students from most developing countries to achieve high levels of technical understanding, seeking to gain qualifications

and certification which gives credence to their training achievement. Whilst this is accomplished by some of the more able students attending training courses, it is not generally the case. This should not be seen in any way as disappointing, but rather a giant leap in the establishment of robust rescue and fire-fighting teams who, when called upon in the event of an aircraft emergency, will be able to utilise the appliances and equipment available to them to maximum effect. In this context if you were a passenger in a burning aircraft and you had a choice between Albert Einstein and Arnold Schwarzenegger to affect your rescue, who would you choose? You have approximately 90 seconds to make this decision; the wrong choice will mean your ultimate demise. This is of course a simplistic parallel; clearly men of great intellect have made aviation one of the safest modes of transport. However when aircraft accidents occur there is a need for positive and determined action demanding stamina, strength and resolve, if passengers and crew are to be rescued. Surely this is what ICAO seeks to achieve in terms of the training of rescue and fire-fighting personnel. Those personnel who have the capacity and wherewithal to progress their technical understanding should be encouraged to do so. This is an area of training closely

*From any standpoint, personnel undertaking any form of employment must be trained and competent to undertake the duties and responsibilities for which they are liable to be tasked.*

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monitored and encouraged by the College. They will become the officers in charge of airport crash crews, the best eventually becoming commanding officers of respective rescue and fire-fighting services.

I have laid emphasis on developing countries and their need to promote aviation rescue and fire-fighting training. It should be remembered that there are some countries in the developed world that pay lip service to the provision of rescue and fire-fighting at airports. Whilst it could be argued that developing countries may have other priorities on which to spend vital financial resources, what reasons can those in the developed world put forward for shortfalls in RFFS provision and training. Economic viability, the need to ensure a cost-effective operation, a judicious interpretation of ICAO requirements may all be postulated. This will invariably produce a depleted RFFS, a token service that salves consciences, *"it will never happen here"*. An example of cost effective RFFS at a Category 9 airport, which calls for three appliances to be available, invariably produces three RFFS personnel manning these vehicles. Such provision may indeed be cost effective but in practical terms such manpower levels disown any concept of rescue, let alone the reality of dealing with an aircraft accident/incident and the possible complexities, which may arise should there be of mass evacuation by passengers and crew.

Importantly in terms of RFFS personnel is their level of physical fitness; a problem predominantly identified with developed countries. How any fire-fighter can believe that in permanently carrying two or more stones excess bodyweight they will be able to perform effectively at an aircraft accident/incident defies common sense. NFPA annual figures on fire-fighter deaths in the



Pic courtesy of FSEC

United States show that the greatest proportion of those deaths occurs through heart related diseases/attacks. The rescue of passengers from within an aircraft cabin where passengers may be trapped or incapacitated, will in all probability require RFFS personnel to utilise breathing apparatus. Should there be a fire internally rescue cannot be effected safely without its adoption. The use of such equipment, even modern lightweight sophisticated apparatus, can be physically demanding. This scenario will demand well-trained personnel, who must remain calm, and composed so as to be effective, it may also require considerable physical exertion on their part. Without this capacity they will be ineffective no matter how sophisticated the equipment utilised.

Physical fitness training for RFFS personnel is fundamental and must become inherent in the lifestyle of all fire-fighters. This lifestyle should be developed and engendered during basic training, and fully incorporated within ongoing daily training programmes.

The fact that a good number of senior officers ignore the obesity of their crews and their obvious lack of physical fitness

is perhaps a testament to the labour laws within those countries, rather than to any lack of understanding on their part. This is one problem that rarely affects developing countries where obesity is rare, certainly to the extent that it is found in the developed world.

Physical training, together with fundamental basic fire-fighter training is a prerequisite for success at the scene of an aircraft incident. I have seen physically fit fire-fighters utilise forty-year-old appliances and equipment to maximum effect, almost as though it had come straight from the workshop and in pristine condition. They were well trained and well led and more than able to tackle an aircraft accident/incident, their self-confidence and zeal tangible. Conversely I have seen unfit and poorly trained fire-fighters with the most modern and sophisticated equipment being bewildered and perplexed because a *"Ready Button"* failed to function of cue. Whilst they were well equipped with an abundance of resources their lack of sound basic training was demonstrable as was the quality of leadership and self-motivation.

*The fact that a good number of senior officers ignore the obesity of their crews and their obvious lack of physical fitness is perhaps a testament to the labour laws within those countries, rather than to any lack of understanding on their part.*

There is still much to be done in enhancing training of RFFS personnel in the Gulf region, but trainees are keen and enthusiastic and eager to enhance their practical ability and technical understanding. They demonstrate great pride of service and patriotism, which makes training enjoyable and outcomes more readily achievable. The Fire Safety Engineering College in Oman has made giant steps in the training of RFFS personnel from this region and whilst there still remains a good deal to be done solid foundations have been laid.



# // Hot under

## (An investigation of the physiology)

By David Carson

### SUBJECT

This report aims to highlight some of the key issues facing F.B.T.I's.

### BRIEF

A review of current practices and understanding relating to "Live fires"

### TOPIC AREAS

1. Exposure to heat/ humidity
2. Exposure to products of combustion
3. Occupational health monitoring
4. Protective equipment options
5. Future trends

### BACKGROUND

The issue of physiological stress was raised during an FBI seminar held at The Fire Service College during 1999. It was proposed that heat monitoring tests be carried out to quantify the level of exposure for staff/ students.

The compliance framework document provides guidance on health monitoring for all staff involved in fire behaviour training. (FBT), this is further emphasised by the latest home office publication on the management of heat stress during training.

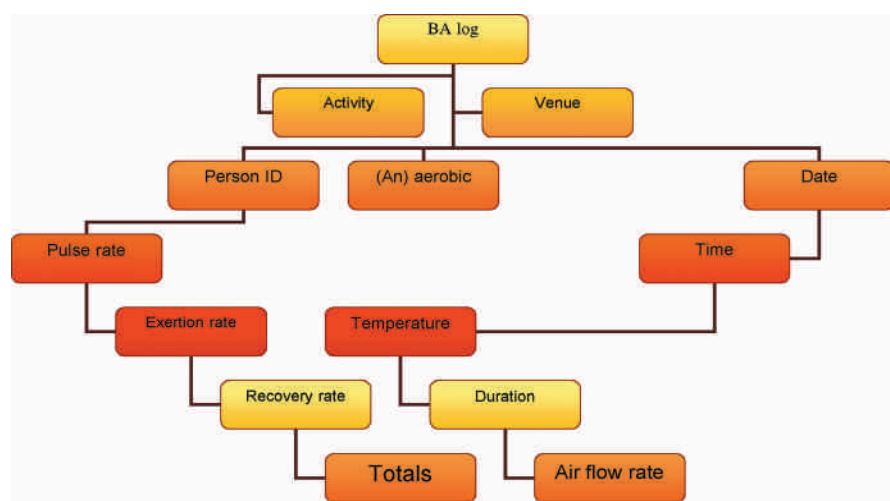
### PRESENT

The Fire Service College is currently reviewing its policy on FBT, we now have a staff BA log, which provides a database of duration, exertion levels and recovery rates.

This can be further enhanced by the provision of ambient temperature; air flow rates and pulse measurement, available via the Draeger bodyguard, as follows:

- A database to hold and report on officer's use of BA equipment. The database will contain a record for each Officer with an attached table containing each usage of the equipment. The main form will contain these fields:
- CD Number
- Exercise Type – Pull Down List Venue – Pull Down List Activity.
- NI Number (primary key)
- Exertion Rate
- Recovery Rate
- Totals – Exertion \* Recovery
- Duration
- Comments

### F.S.C. staff monitoring options



- Date – Calendar – "Click on date" rather than "type in date"
- Reports – SQL
- A graph based on a date range.
- Automatic flagging if exertion rate exceeds pre-set threshold
- Staff health monitoring will be conducted by a dedicated occupational health team.
- Line management will have tiered access to group/individual data.
- Database can be expanded to include specific data requests (see data options)

### TECHNOLOGICAL ASSISTANCE

Recent developments in chemical transformation have led to the production of various devices designed to reduce core temperature of FBTI's.

### COOL VESTS

A number of companies are producing this garment, using an active "water gel" hermetically sealed in a flat-pack, this can be stored in a fridge, then, prior to use, the packs are inserted into pockets covering front and back torso, similar to a flak-jacket.

An evaluation was conducted during November 1997, at the American air-force test centre in Texas. Ten volunteers underwent heat exposure exercises, with and without the vest, a 22% increase in firefighters working duration was noted, they

also reported a noticeable difference in comfort levels and reduced recovery times.

One such vest is currently on trial at the Fire Service College, with positive user feedback on the reduction in exertion levels and recovery time.

### RADIAL COOLING

Section 4.3.1 of the home office guidance note mentions accelerated cooling as an accepted method for reducing core temperature post-burn.

A recent study proved the effectiveness of simple radial cooling by immersion of wrists in a bucket of cool water, the red line is with no cooling, the others indicate water temperature ranging from 20-10°C.

### CORE TEMPERATURE COOLING TECHNIQUES

One inherent flaw in this simple system is the reliance on individuals to utilise the facility, there are practical/time implications of allowing 10+ students to gather round buckets of water.

One option may be to adapt the cool-gel for use in wrist-bands, these could be issued to each student prior to exercise, and would provide the added benefit of ensuring comparable cooling options for staff and students.

### CARBONACEOUS FIRES vs GAS FIRES

There is an on-going debate regarding the respective benefits of these two systems.

# the collar"

## gical elements of an FBTI role)

Gas fired rigs provide a (relatively) clean burn, with greater control over the environment, the draw-back being the lack of realism.

Carbonaceous fires provide a more realistic scenario, and are (relatively) cheap to run.

The main draw-back is the environmental impact with products of combustion.

This means that only a few sites in the UK are given a license to burn.

Another more sinister issue is the long-term exposure to student/staff from utilising chip-board in the fire containers.

A recent study has highlighted the potential damage to individuals from the unburnt products of combustion. These include Ammonia; Hydrogen cyanide; formaldehyde; and methyl isocyanates. All of these chemicals can enter the body through percutaneous absorption as well as inhalation and ingestion. They are toxic and carcinogenic and will attack the liver; kidneys and central nervous system over a long period.

The only way to achieve a "clean" burn, requires temperatures in excess of 750°C.

This is rarely achieved in the current fire behaviour units.

The result is that students and instructors exit the unit covered in a sticky coating of chemicals, they then proceed to remove their BA sets, take off the jacket and have a drink of water, and the probability of cross-contamination is obvious.

### RISK REDUCTION

A number of options exist for reducing the likelihood and severity of contamination.

The first would be to remove the risk, ie; use "clean" white wood. This has a major cost implication and would be hard to achieve, as most wood is pressure treated in some way before leaving the saw-mill.

Some Swedish brigades perform a partial decontamination, post-exposure. The wearers disrobe with BA still on, the items are bagged and removed for specialist cleaning, and new kit is supplied after they shower. This too has a major cost implication as well as the logistical issues.

A more cost effective compromise may be to apply barrier cream prior to donning; clean boiler suits could be issued for post-exposure, surgical gloves and dust-masks worn while transferring dirty fire-gear. Shower facilities must be provided close to the working area, with

clean and dirty zones clearly demarked.

It should be noted that the issue of contamination extends beyond the staff and students, it also affects fire-ground staff who are tasked with the removal of debris following training exercises, this "ash" will still contain a significant amount of unburnt hydrocarbons and should be treated with the same degree of concern.

Fire-ground staff, at the FSC are currently provided with dust masks and gloves for use during clearance operations, it could be argued that this level of protection is inadequate, and that full CABA should be utilised, again this has major repercussions in terms of time/ training requirements.

The issues of long term health monitoring also need to be addressed, with occupational health providing periodic screening of staff, ie, on a monthly basis.

### HYDRATION POLICY

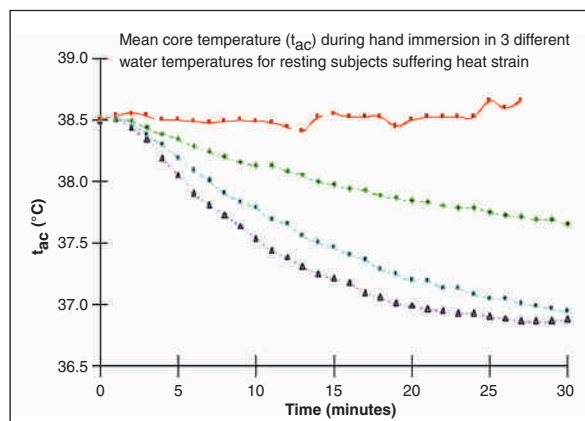
There has been much research in the field of hydration, mainly based on persons involved in sports; this activity differs from our role in terms of heat exposure.

The Home office guidance document on heat stress recommends a degree of water "pre-loading" (250 ml), with rehydration post-exposure an important element.

It states that cool rather than cold drinks are preferable as these may cause local vasoconstriction of the blood vessels in the stomach, resulting in a slower rate of absorption. One contentious comment is the statement that it is not necessary to provide saline solutions, as the salt concentration of sweat is less than that of blood.

This statement is contested by Dr. Mandy Stirling of The Leicestershire Fire Service, she has recently released a paper entitled - "Hydration guidance - is drinking too much water dangerous" in which she highlights the fact that hydration guidance by its very nature must be general, as people differ greatly in their fluid balance levels.

The issue of hyponatremia (low sodium levels), is a potential problem if sweating profusely for long periods, with only fresh water as fluid replacement. This will lead to dilution of the electrolyte content of



the plasma, and may interfere with brain, heart and muscle function.

Dr. Stirling recommends 150-200 mls of fluid every 20 mins, this should contain some salt to maintain electrolyte balance, another option is to eat salty snacks, but this may prove impractical on the fire-ground, especially considering the contamination issues raised earlier. She also sets a maximum fluid intake of 1litre per hour; any more is erring towards excessive intake.

### CONCLUSIONS

The purpose of this report was to be a discussion document on some of the issues facing FBTI's, I hope it will act as a catalyst for further debate.

The inherent risks involved in any form of fire behaviour training are well documented, and the Compartment Fire Behaviour Training working group has been created to act as a forum for national debate.

The role of Fire behaviour instructor is, by its very nature an arduous one, with little empirical research on the long-term effects associated with this post.

We must ensure that best practice prevails; this will involve collaborative working and a mutual agreement that by ignoring these issues we (the UKFS) are leaving ourselves open to vicarious liability in the future.

Herein lays the quandary, because most of the effects mentioned in this report will not appear for many years, in a similar vein to the "Asbestosis" claims from rail workers.



## AND THE BEST SUPPORTING ROLE GOES TO ...



AN award-winning global emergency services specialist is to provide vital life-saving equipment to Britain's fire services.

The Aire Group has been awarded the tender to supply support systems designed to prop up collapsed buildings nationwide.

The company – based in Huddersfield, West Yorkshire – will be supplying the Paratech urban search and rescue strut system which has already

proved itself in action after disasters worldwide.

The strut systems are part of the British Government's multi-million pound investment to provide its fire service with the latest urban search and rescue equipment.

The Aire Group – the UK's marketing partner for USA company Paratech Incorporated – used to be known as Aisheltha Ltd and has forged close links with emergency services all over the world from the USA to Japan and Hong Kong to the Maldives.

It changed its name to The Aire Group to reflect its ever-increasing expansion into innovative new products.



Aire Group Chief Executive Richard Bailey said: "We have a policy only to provide top quality products which people know they can rely on when they are out there saving lives.

"The super-strong Paratech rescue struts are nothing short of a mobile life support system and can be used to prop up debris in collapsed or dangerous buildings and keep trenches from caving in. Any firefighter will tell you that collapse rescues are the toughest and often trickiest challenges they face. This equipment

means they will be able to take on those challenges in complete confidence."

He added: "Structural collapse emergencies happen somewhere in the world every day. Now with the terrorist threat so real, we have seen recent terrible examples of the havoc suicide bombers can wreak on buildings. The Paratech support struts are designed to deal with these kind of catastrophes and would also be used after gas explosions, road accidents where vehicles have crashed into buildings, trench rescues and natural disasters such as earthquakes. The recent earthquake in Iran shows the devastation that can be caused, but people are pulled alive from the debris days later once rescuers get to work with the proper equipment."

The Royal Berkshire Fire And Rescue Service in England won the 2002 world extrication championship and will not use anything but Paratech struts at road accidents.

Its team leader, Station Officer Ian Cox said: "We'd tried all kinds of other stabilisation products before we discovered the Paratech equipment, but nothing has given us such stability. We now have a golden rule to use them every time we need to deal with an overturned vehicle. The Paratech struts beat the other products hands down and my message to other fire services is simple – you've got to have them."

The Paratech system is quick and easy to deploy and includes strut extensions along with specially-designed base and end plates to give a secure fixing to a range of contact points. It can even be deployed pneumatically and locked in place from a distance for maximum safety.

The struts are made from aluminium alloys for maximum strength, yet are amazingly lightweight and can be used on surfaces ranging from sandy soil through to smooth concrete and metal. They have been designed to cope with just about any collapse scenario firefighters will have to face.

The Aire Group forged its reputation with the pioneering Aisheltha inflatable buildings which have been used as command and control centres at the



scene of major disasters and incidents worldwide including the Selby and Paddington train crashes in the UK and the terrorist attacks in the USA on September 11, 2001.

In recent years the company's product range has expanded so much it now has six distinct categories – Aishelthas, decontamination, personal protection equipment, specialist rescue, urban rescue and tactical equipment.

Its Aishower mobile decontamination unit won the Queen's Award For Enterprise in the UK and is used worldwide from America to Japan.

Mr Bailey added: "Taking all this expansion into consideration we felt the restructured company needed a new name and so we opted for The Aire Group. We have had a new website developed – [www.airegroup.com](http://www.airegroup.com) – which clarifies the company's product range in six easy-to-understand colour-coded sections.

"The company is rapidly becoming a global one and our name change reflects that."

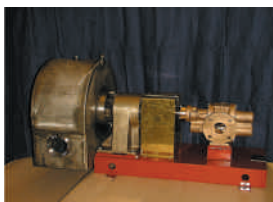
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bronze or stainless steel cased pumps. Pumps are protected by an in-built relief valve.

Pump drivers are usually electric. Diesel engine driven pumps are often supplied with control panels to start the diesel pump if the electric supply fails. Flows of up to 1400 l/m are offered. Albany's twin screw pumps extend the range to 4000 l/min.

Albany water turbine driven pumps are totally safe and save space. They are popular in hazardous areas offshore, on oil or gas loading jetties and onboard ship. Water power for the turbine can be provided by the installations' main fire pumps. Onshore a fire tender's water pump can power the turbine.

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## “POSITIVE DISPLACEMENT PUMPS TAKE THEIR PLACE”

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The title was changed. This significant but often unnoticed change underscores the vast amount of changes inside the document. Electric pump controllers, booster pumps and numerous other areas of the standard have undergone substantial change.

Most notable from some persons perspective is the addition of Chapter 5 in the 1999 standard. This chapter address's the type, use and application of positive displacement pumps for the fire service. Never before has any NFPA standard addressed positive displacement pumps in this level of detail and application requirements.

The underlying need for Chapter 5 was the fact that water mist systems and foam systems use positive displacement pumps for critical, special hazard applications. Yet the unique features and application requirements of these style pumps were not addressed until the 1999 NFPA 20 standard was issued.

Now positive displacement pumps are available that are UL listed and FM approved for foam concentrate, water mist and traditional low flow fire pump service.

The performance of water mist systems that use pumps rely on the ability of positive displacement pumps to generate high discharge pressures at relatively low flow rates when compared to the more well known and recognized centrifugal fire pumps.

In addition, foam concentrates exhibit liquid characteristics that vary greatly from water and thus special attention must be given to the pump type and application to the foam system. This makes the positive displacement pump a necessity when used for foam applications.

In summary, positive displacement pumps of all types have been recognized and acknowledged by the NFPA and fire protection industry specialist's as a critical fire system component that deserves the attention of all parties in the fire protection industry.

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IFI – Industrial Firefighters International was established in 2003 and now observes forum discussions amongst a membership of 100 Industrial Fire Professionals – including Facility Chiefs, Safety Personnel, Process Operators, Instructors, Medical Responders, and more.

We aim to facilitate open communications with Industry Professionals, Training Agents, Standards/Regulatory bodies, and Products & Service companies to better support the safety and professionalism of the Industrial Fire Professional.

IFI reaches leaders in multiple industrial sectors such as Exploration, Processing, Storage Facilities, Marine, Nuclear, Mills, Terminals, HazMat, etc. to create a comprehensive resource for intelligence and training information.

Recent topics have included Crude oil fires, boilovers, pharmaceutical fires, accountability systems for incident management, LPG leaks, CAFS systems, systems design, and more.

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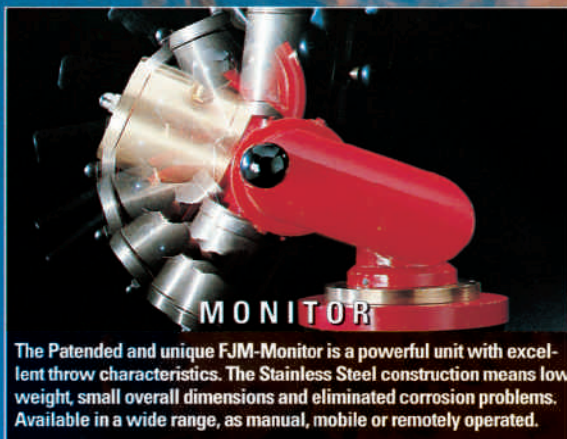
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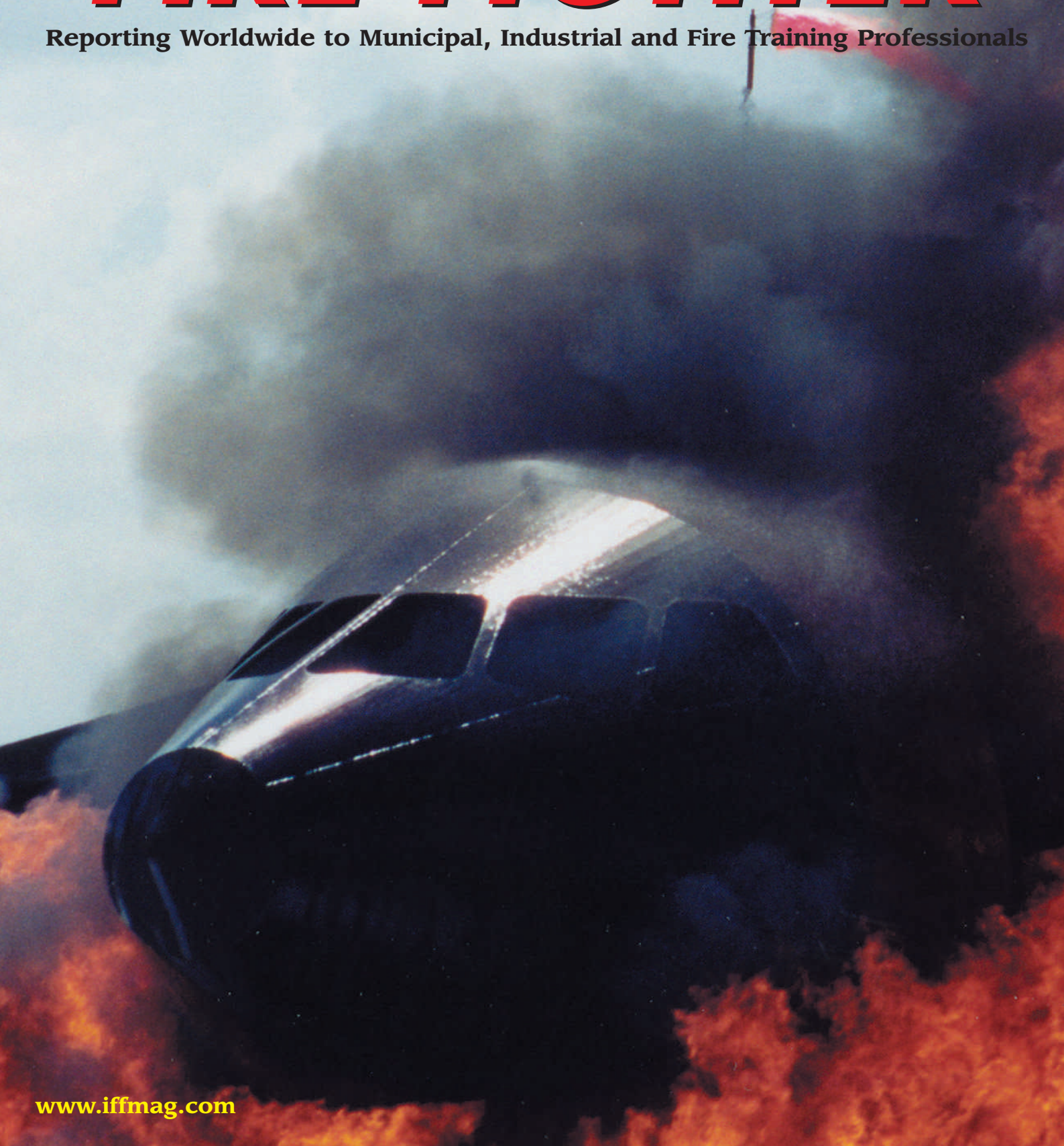
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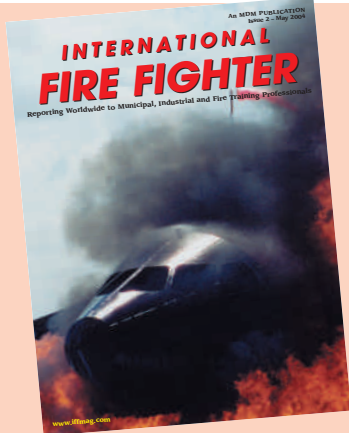
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## COMMENT

Welcome to the second edition of *International Fire Fighter* (IFF) magazine. Since the launch of the first issue, I have had numerous e-mails and phone calls from readers and advertisers commenting on the fruits of my labour and I would like to say, not one negative response. I would like to thank you all for all these words of encouragement which will ensure that our efforts will be doubled in bringing you the latest news and stories from around the world to educate, and to inform you all of the latest developments in our constant battle to reduce loss of lives and property from fire.

In April, we exhibited at the FDIC show in Indianapolis and was pleased to hear that it produced a record turnout for visitors as well as exhibitors, thus reinforcing the commitment we all have to share our knowledge within this industry.

Thank you once again for all your positive comments, please keep them coming and we look forward to seeing you again at the IAFC show in New Orleans in August.

Mark Bathard  
Sales and Editorial Manager



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# Self Contained Breathing Apparatus Standards

**By Tony Pickett, Product Manager –  
Sabre Breathing Apparatus  
Scott Health and Safety**

LIKE MOST PRODUCTS that are sold in a global market breathing apparatus have to meet certain standards and are subject to approvals. These standards and approvals vary from region to region and include EN, Standards in Europe, Niosh and NFPA in the US, AS1716 in Australia and JIS in Japan. The two most widely recognised are those from Europe referred to as European norm (EN) standards and the National Fire Protection Association (NFPA) standard as used in the US.

The following will address some of the most pertinent differences between the US standard, NFPA 1981 for fire-fighting breathing apparatus and European Standard EN 137 for self-contained breathing apparatus. There are slight differences between the two standards in aspects such as breathing machine rates used in the performance tests but these will not be discussed here as the end result is very similar.

Although these standards are for similar types of equipment, used for the same types of applications, there are some significant differences that reflect the origins of each standard.

It is also important to understand the context within which the NFPA and EN standards were devised and enforced. The fire service in the United States is 70% volunteer/part-time in comparison to Europe's predominantly professional/part-time. European fire services tend to operate regionally and benefit from nationally regulated training programmes and procedures. In the US, fire departments are typically organised on a local basis and typically did not have nationally enforced regulations with regard to operational procedures.

NFPA Standard is not Federal requirement but insurance consideration. Fire fighting in the US is primarily driven by Insurance requirements to restrict property and personal injury claims. In UK the primary purpose is to safeguard life and as a second priority to restrict damage. These two approaches mean that the US fire-fighter puts him or herself at greater danger to fight a fire, in many cases from within a building. The UK approach is to fight the fire from the outside and only go into a burning building if life is threatened.

Consequently, historically, the equipment specifications for NFPA are

deliberately more stringent, in recognition of the levels of training and control, and the likelihood of encountering extremely hazardous situations because of the invasive methods of fire-fighting used in America.

Furthermore, the concept of preventative and scheduled maintenance is less prevalent in the USA and has to be accounted for in the equipment design and specification.

In short NFPA is a standard that specifies many features that are compulsory on a BA set whilst EN standards have less compulsory features but allow for additional features. If the BA sets have a particular feature then it must meet the performance standards that are laid down.

This allows European fire brigades to choose and specify the features that they need to fit in with their operational requirements whereas an American brigade will basically have to take a package containing everything as standard.

*In short NFPA is a standard that specifies many features that are compulsory on a BA set whilst EN standards have less compulsory features but allow for additional features.*





## Self Contained Breathing Apparatus Standards

In September 2002, the new revision of NFPA 1981 came into effect which introduced some further requirements for SCBA not currently being considered by the CEN committee. However the latest draft of the European Standard for self-contained BA, EN137 has now identified a new type 2 definition for SCBA used for fire fighting applications. This new type 2 classification will require a flame engulfment test similar to that required for the NFPA 1981 specification. This standard is in the formal comment stage and is likely to be fully ratified late in 2004.

One of the fundamental differences between the US and European approvals is the need in the US to satisfy both an approval and certifying body i.e. NIOSH, who test to Federal regulation 42 CFR part 84 as well as obtaining additional qualification to the NFPA performance standard. NIOSH certification is required as a pre-requisite for NFPA approval. Looking at the

*One of the fundamental differences between the US and European approvals is the need in the US to satisfy both an approval and certifying body.*

new En standard a broad brush could be applied saying that the Type 1 apparatus tests are equivalent to Niosh approved apparatus with the type 2 sets being more equivalent to NFPA sets. The CE regime is considerably looser in comparison to satisfy the respective demands of the sixteen CEN member states.

Because of the NIOSH element of this process is it virtually precludes the approval of a European or NFPA configuration SCBA to the other standard as in certain areas the two standards are mutually exclusive. The best example of this is with regard to cylinder connectors, valve and shells. These must all be qualified to the necessary US or EN specifications, US sets for example must use CGA 346 and CGA 347 fittings for low and high pressure respectively whilst European sets have to use a threaded fitting complying with EN-144-2. The cylinder is an integral part of each individual NIOSH set approval and cylinders have to be purchased from the set manufacturer to maintain approval. It is therefore impossible to have a NIOSH/NFPA approved set that does not use an American cylinder and cylinder connection.

In order to highlight the principal differences between these two standards, the following provides a brief explanation of the actual requirements for each of the respective standards:

### HEAT & FLAME RESISTANCE

There are two stages of heat and flame tests within NFPA 1981 standard. There is a heat and flame test on material used to secure the SCBA to the user and a complete flame engulfment test of a complete operating SCBA, whereas there is only one flame test currently required for EN 137.

EN137 is currently under revision with a new prEN137 undergoing formal comment. Within this new draft is a requirement for a complete flame engulfment test – similar to that required under NFPA 1981.

The flame engulfment test has received much publicity and debate of late, but with these changes to the European Standard, there will be no discernible differences in terms of product performance in relation to flame resistance between NFPA and EN sets.

The material heat resistance test in NFPA is also critical in meeting the material selection criteria. Swatches of the harness materials are placed in an oven at 500°F for a short period of time. The only materials that survive this test are typically made from intrinsically flame-retardant materials such as aramid (Kevlar), Nomex or blends of similar type of materials. The disadvantages with these 100% Kevlar materials is that they are very expensive as well as having lower resistance to wear and abrasion than polyamide materials

### VISOR SCRATCH RESISTANCE TESTS

An additional test to meet the NFPA is a visor scratch resistance test where the visor is abraded and has to meet

*The flame engulfment test has received much publicity and debate of late, but with these changes to the European Standard, there will be no discernible differences in terms of product performance in relation to flame resistance between NFPA and EN sets.*



minimum levels of optical clarity. The test basically rubs wool felt polishing pad across the visor with a specified amount of force behind it, a specified number of times before the visor is tested by a machine to measure the amount of hazing.

The standard European EN 136 mask visors do not have to meet this specification, although visors with an NFPA specification can be fitted to the mask if required however this increases cost to the customer as the NFPA visor is considerably more expensive due to the more complex and expensive coating process.

#### SECONDARY WARNING (EOSTI) DEVICES

NFPA has a requirement for two low-pressure warning devices on each SCBA. These must be entirely independent in operation and each must attract the attention of an independent human sense. Typical approaches to this are providing a visual indicator on the gauge, on the ADSU/PASS or in the facemask as well as a whistle. With the current operational procedures and controls generally employed within the UK and European markets, there is no discernible demand for such a device.

#### HEAD UP DISPLAY

A new requirement that is being introduced into NFPA standards is the head up display, this must show cylinder contents in at least 4 equal increments from full to ? full, a Numeric display alone is not acceptable. There are very strict criteria about the light levels that this head up display must be visible in, from the equivalent of full sunlight to very low light. This HUD could also fulfil the requirement for the secondary EOSTI above. There is no such requirement in the European standards for this although several manufacturers do offer such a device as an option.

#### VIBRATION TESTS

In this test a BA set is contained within an open topped metal box and shaken for 3 hours at 250 hertz. This is incorporated to simulate a BA set being left unsecured in a pick-up truck where it could roll around for prolonged periods of time between use. This will mean that many loose parts of the BA set will require additional protection possibly

making the set bulkier and heavier. The European standards have no equivalent vibration test to this, the assumption being that BA sets should be stored and secured properly in the fire appliances.

#### RIC CONNECTOR (RAPID INTERVENTION CREW)

This is a fast-fill connector by another name. It will allow rapid charging of an SCBA while it is being used. This can be used for recharging a system or the decanting of air between one SCBA user and another. To do this an appropriate charging hose also has to be provided. One charging connector is specified which operates at 4500psi. A

resetting PRV is required on all units to ensure that over charging is avoided.

In the European standard this type of product is incorporated into an annex to the main standard so if it is fitted to a EN set then it must meet the relevant performance specifications but it is not compulsory.

#### CONCLUSIONS

Whilst comparing the two standards and looking at sets meeting each standard it is clear that most of the primary components of the EN137 approved apparatus i.e. facemask, demand valve, pressure reducer and whistle would pass the NFPA Standard and vice versa.

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## Self Contained Breathing Apparatus Standards

Indeed manufacturers that operate in both NFPA markets and EN markets use near identical primary components on the versions of the sets they market in these different areas.

The incorporation into EN137 of the flame engulfment test for type 2 sets also mean that the materials used to fabricate the harnesses and backplates are of equal flame retardancy to those sets with the NFPA approval.

Because many manufacturers are now global businesses they have a

commitment to satisfy the needs of a global marketplace and keep abreast of the developments in all markets. This global market experience is put to best advantage in terms of providing single product solutions that can address the needs of multiple markets. This leads to them developing common basic platforms, however, because of differing market structures and regulations, it is necessary to make superficial configurational changes to product to satisfy local market demands, whilst not compromising the desire to achieve the highest levels of performance. This common platform will therefore generally meet or exceed the basic requirements of most of the different standards throughout the world with the major product differences coming from the market specific additions.

Both standards make sure that manufacturers are making sets that will withstand higher temperatures than the person wearing them can take, provide more air than a human could possibly breath and will therefore provide the highest level of performance to the fire fighter. The different way in which the standards approach the choices that

they give the fire brigades will generally mean that an NFPA set can cost 3 to 5 times as much as an EN set purely down to the compulsory features that have to be incorporated for this standard to be granted. With economic pressure becoming a fact of life for both fire brigades and industry alike we may over time see customers moving towards the lower cost option of the EN sets where presently both standards are accepted.

To complete the Jigsaw it is worth mentioning that work has just started on an ISO standard for breathing apparatus, this has the aim of creating one standard world-wide for BA with committee members coming together from Europe, Japan, the US and Australia. This will doubtlessly not be a quick process, it took many years for the European countries to agree before we got to the one EN standard, but in theory the best parts of each standard should come together allowing manufactures to produce one product that will be accepted world-wide.

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# BA COMPRESSORS ROUND UP

## COLTRISUB

Safety means knowing that you can rely on the most suitable instruments in every situation. Safety in the sea means enjoying a great pleasure by not only relying on one's experience but also on the expertise of those who for years have been designing and engineering instruments that are able to transform each dive into a unique and unforgettable adventure. In a word: COLTRISUB, means all this.

Coltrisub manufacture and export a range of products world wide including a range of breathing air compressors for filling scuba cylinders.

The factory is based in Brescia, Italy and has 28 highly skilled technicians and employees involved in the testing, design and manufacture of the compressors. The company has vast product experience in the diving sector and provide divers with products that are ever safer and state-of-the-art. Advanced technology, ongoing research and unique expertise are used to supply a wide range of compressors suited to any needs - whether a professional dive centre or a portable version for individual use. The smallest compressor available is the MCH 6 and the largest is MCH 32.

The range includes both petrol, diesel and electric powered versions (single and multi phase). With operating pressures of 3200 - 5000psi (225-330 bar pressures).

All compressors are supplied with a pure air certification.

### MCH 6



The compact dimensions and lightweight of this petrol driven compressor make it very easy to transport. It is an extremely reliable unit and is ideal for filling cylinders on land or in boats.

### MCH6/SH - Technical Specifications

Filling Time: 30 Min.

Litres/min. 100

hour - : m<sup>2</sup> 6

Motor: Petrol

Engine: HONDA GX 160

Engine power 4kW - 5.5 HP

Condensate discharge: Manual

Operating pressure: 3200 - 4300 psi

RPM: 2,800

No. of stages: 4

Lubrication: Splash

No. of fill hoses: 1

Noise level: 87 dBA

Dimensions (height, width, depth): 36 x 75 x 32 cm

Weight: 37 kg

Air quality: DIN 3188 - CGA/E - UNI EN 132

A customer-centred and comprehensive distribution network and products of superior quality have ensured the full satisfaction of all its customers, both professional and recreational divers. In fact, since 1954, COLTRISUB has been a byword for all scuba enthusiasts who want safe but exciting diving.

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## NEW SCUBA CONTAINMENT FILL STATION FROM COMPAIR MAKO

CompAir Mako has offered certified containment SCBA fill stations as a part of their product line for almost 20 years now, offering full protection to personnel while filling SCBA cylinders. Designed to contain an SCBA rupture, the unit must contain all fragments from the exploded cylinder and safely vent the rapidly expanding air. Safety is also ensured during loading and unloading as SCBA filling cannot commence until the fill station door is secured in the closed position and, if the door is opened during the fill process, a safety interlock system stops the airflow to the SCBA cylinders.

The traditional CompAir Mako stationary fill stations have the capacity to house two or three SCBA cylinders and it made perfect sense to increase the protection offered to fire department personnel filling scuba cylinders that have a larger capacity than SCBA cylinders without the benefit of fiber-wrapping. Not only will this new fill station fill the typical 80 (CF) scuba cylinder, but it will also house 90, 100, 110 and 120 (CF) scuba cylinders (approximately 10-15 litres.)

The new scuba fill station has been successfully tested and certified to contain a full cylinder rupture. For the stringent test procedure CompAir Mako milled a groove into a 100 CF scuba cylinder to weaken the wall for the test and ruptured it at a pressure of 6100 psig (421 barg) for the containment certification. (The 100 CF cylinder at 6100 psig is roughly equivalent to the same volume as a 120 CF cylinder at 5000 psig (350 barg).) A safety relief valve on all 6000 psig (414 barg) systems protects

against exceeding a pressure of 5000 psig to the fill whips.) The fill station is capable of housing up to three scuba cylinders and during testing the other two fill positions held similar pressurized scuba cylinders.

The new unit incorporates the same innovative technology that is built into the entire line of CompAir Mako stationary containment fill stations, such as a balanced axle design supported by bearings for the door providing a platform for user-friendly SCBA loading/unloading. The control panel includes an adjustable self-relieving pressure regulator, a metering fill valve with pressure gauge, and an innovative cascade control system. This system provides a pressure gauge for each cascade bank, and offers the unique capability to allow the operator to draw air from one bank to fill an SCBA cylinder while simultaneously refilling another bank with the compressor. This built-in efficiency minimizes compressor size while maximising its ability to handle peak demand.



### Mako MCFS1

CompAir Mako has also expanded its line of mobile containment fill stations to include a single SCBA unit. This was designed to allow customers with limited space on an existing vehicle to adhere to the new NFPA guidelines for filling SCBA cylinders on a truck. Now CompAir Mako has a complete line of one, two and three-SCBA mobile containment fill stations. As is the case with all of our mobile fill stations, the new single SCBA unit is tested in accordance with National Fire Protection Association guidelines (NFPA 1901.)

With the extensive range of containment fill stations available from CompAir, fire personnel will not only breathe easy but can be assured of safe filling as well.

*For more information, please contact:*

**CompAir Mako**

USA - www.compairmako.com or

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Unifire offers a wide range of blowers that use gas, electricity or diesel to power the high performance motors. Also, Unifire blowers come in a range of styles to suite your every need and price range. Each gas or diesel blower comes on Unifire's stainless steel wrap around frame that can be tilted from -10° to +20°, allowing for ventilation of any area from a basement to a window or doorway. The stainless steel frame comes with

or without a 35" extendable handle and solid rubber 8" wheels that act just like pneumatic wheels.

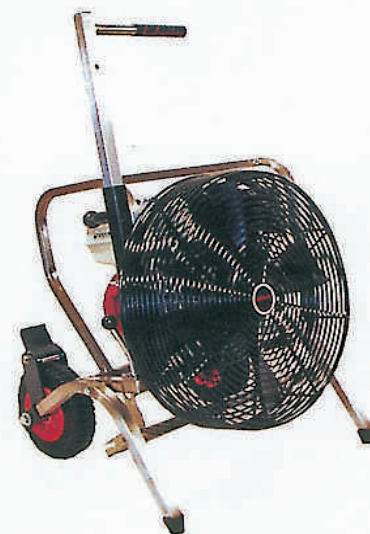
A third available frame style is the Du-All 180° frame. This frame is only available with the electric PPV fans and features the 35" extendable handle, wheels and is able to be rotated up to 180° inside its frame, allowing airflow to be directed straight up or straight down, and anywhere in between.

All Unifire PPV blowers come standard with open shrouds. The open shroud design allows air to be sucked in from the sides, top, and bottom as well as the back of the shroud. The open shroud design also allows the fan to be placed 3-8 feet away from a doorway or opening. Allowing the fan to be placed on a small patio or landing while other fans would have to be placed 8-12 feet away.

With Unifire PPV blowers the Unitron blade pitch determines the cone dimen-

sions. This also helps with getting the fan closer to where it is needed. The Unitron blade is a standard feature on all Unifire PPV fans and is 100% shatterproof. These blades are made of a synthetic nylon and reinforced with carbon fibers. This material allows the blade to be impact and stress resistant with the best thermal expansion and contraction available. All Unifire blades are direct drive, allowing for 10% more HP transferred to the blade.

Unifire blowers feature an optional patented water misting system. Combining ventilation and cooling into one simple operation, Unifire's water misting system breaks down a droplet of water into a light mist state and injects it into the airflow. The result is a more effective use of water.



It cools the structure quickly and with less water damage. The water misting system also creates a heavier concentration of airflow allowing for quick visibility and easy access; the removal of gases, chemicals and soot; the reduction in fuel temp; assists in locating hot spots; inhibits flame expansion; and reduces firefighter fatigue. 98% of all PPV's produced by Unifire since 1987 are still in use today.

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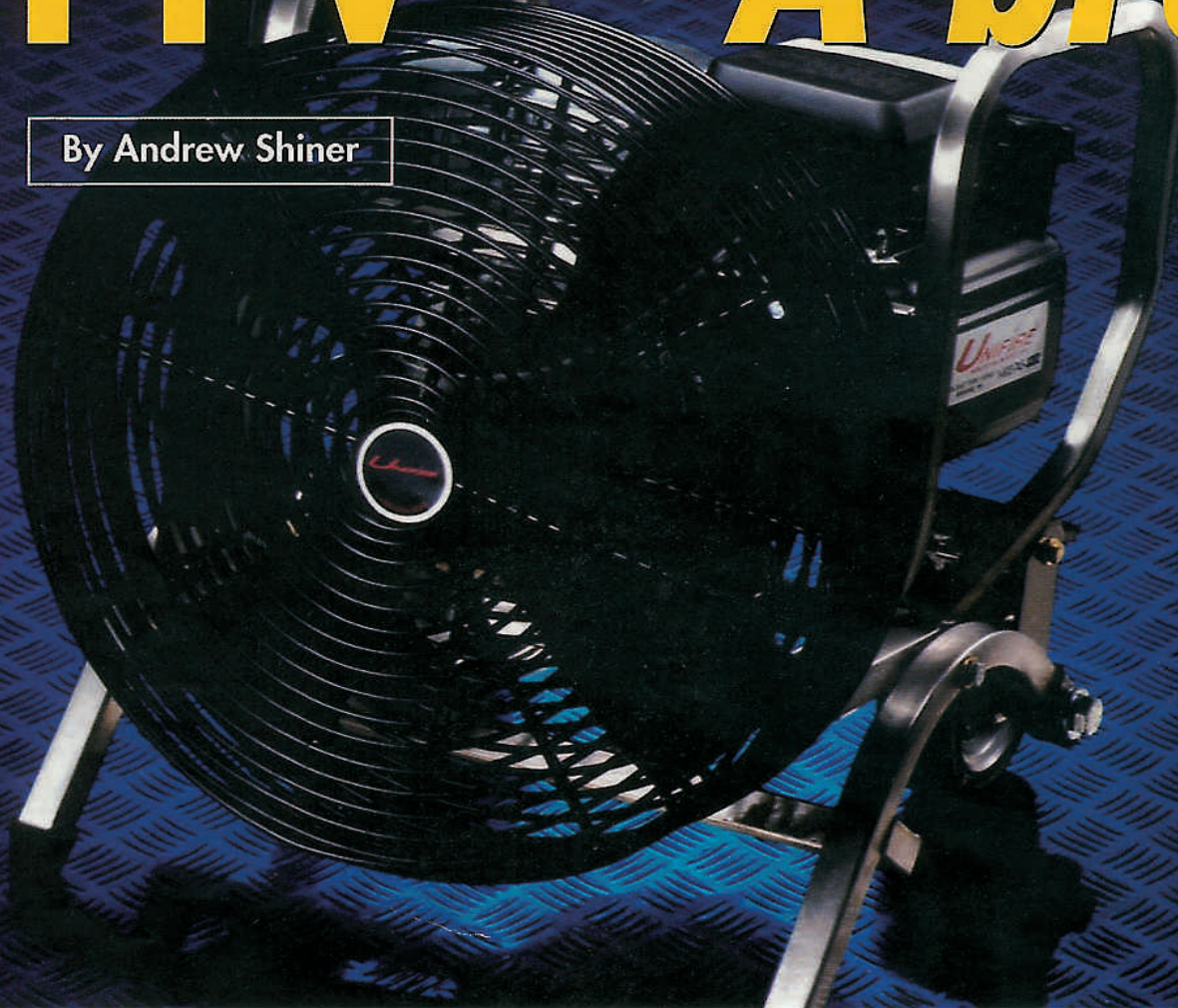
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# PPV – A break

By Andrew Shiner



PPV – POSITIVE PRESSURE VENTILATION – is a firefighting technique that has been around since the 1980s, although it had its origins three decades earlier. In this article, Andrew Shiner, Director of Marketing, Europe, Middle East and Africa, Tyco Fire & Security – Fire Suppression Business Unit, reviews the current thinking on its use and assesses the latest equipment to come onto the market.

PPV was first introduced towards the end of the 1980s, although other ventilation techniques had been widely used prior to its introduction. These included vertical ventilation, electric smoke ejectors and negative pressure ventilation. The latter technique being when smoke and fire gases are on the negative side of the fan, as opposed to positive pressure ventilation when smoke and fire gases are on the side of the fan where the pressure is positive.

These techniques were though, in

the main, utilised after the fire was extinguished.

The air flow was relatively ineffective and it often took considerable periods of time to ventilate the building.

Since the introduction of PPV much has been written about its application, benefits, the need for training and assessing suitable applications for its deployment. However, the general consensus of professional firefighters around the world is that the technique, when properly deployed, offers two major benefits. The effective use of

PPV increases visibility and significantly reduces air temperature.

## WHAT IS POSITIVE PRESSURE VENTILATION?

Positive pressure is achieved when air is forced into a building using one or more fans. These fans force air into the structure or enclosure to create a higher pressure inside the building relative to the external atmospheric pressure. This differential between the pressures forces heat, gases and other products of combustion through a suitable outlet vent to the open air. This also has the effect of replacing the heat, smoke and gasses in the building with cool fresh air.

PPV makes a considerable contribution towards the removal of the large quantities of carbon monoxide and the other toxic and carcinogenic products



# th of fresh air

that are present both during and after a fire. This has a welcome beneficial impact on the health and safety of the building's occupants and those entering the building to fight the fire. Additionally, PPV can help in the important job of maintaining primary and secondary egress routes, and aid in locating the source of the fire.

Other advantages of using PPV include the role it can play in reducing flame spread and the dramatic reduction in time-sensitive search and rescue times that can be achieved.

## HAZARDS AND RISKS

Critics of PPV cite a number of objections. These include that the fan may pick up debris while in operation, that the air stream may pull loose objects into the blade, that petrol-engined PPVs – which took over from the early electric-powered models – produce carbon monoxide, and that engine vibration may cause the fan to “walk” and so become ineffective. They also express concerns over the size and weight of the equipment, what they see as the potential to jeopardise personnel safety if misused and the need for additional training.

However, in practice, these concerns have proven to be unfounded, particularly with the introduction of the latest PPV fans, which overcome the stability, size and weight issues. Both firefighters and equipment manufacturers readily agree though that training is absolutely imperative and that the deployment of PPV techniques needs to be seen as part of the overall firefighting tactical plan.

Tests have shown that the risk of trapping building occupants or firefighting personnel between the fire and the outlet vent is much lower than was originally thought and that the benefits far outweigh any potential disadvantages. The same can be said for concerns relating to the risk of igniting the hot smoke as it mixes with oxygen at

the outlet vent. This can easily be controlled by proper training and providing a covering jet at the outlet vent. In short, all of the recent studies have shown that the likelihood of PPV increasing the risk to occupants of the building are far outweighed by the rapid improvement of the conditions inside the building and more effective fighting of the fire.

## ESTABLISHING PROPER CONTROLS

Arguably, there are six steps that need to be taken to ensure that PPV techniques are effectively and safely implemented. These can be summarised as the need to:

- Use the most suitable equipment.
- Ensure proper training of the firefighting crews.
- Establish effective command and control procedures.
- Establish essential fire ground communications.
- Adopt the most appropriate application techniques.
- Implement a phased approach to the introduction of PPV.

Brigades need to ensure that the most suitable fan or fans are selected, taking into account fan performance, stowage, maintenance, manual handling and noise levels. PPV should not be adopted as part of the fire ground

operations until every member of the fire crew has a thorough appreciation of the use of ventilation, and how this affects the behaviour of fire. It has to be widely understood that PPV needs to be coordinated with other firefighting activities.

Carrying out a Dynamic Risk Assessment at the site of the fire is essential and there are several questions that need to be answered. These include the size of the compartment to be ventilated, the location of the fire, the likely location of any casualties and an assessment of backdraught or flashover potential. Additional considerations are wind direction, determining the location of the essential outlet vent and the provision of jets to cover the outlet and possibly nearby structures.

Clearly, PPV is not appropriate where there is a risk of either backdraft or flashover, until proper communications have been established between the fire crew inside the building and the incident commander. It is also not advisable to use PPV in conditions where the wind strength or direction will obviate the effects of the fan or fans.

## LATEST PPV EQUIPMENT

The latest PPV fan to be introduced by Tyco Fire & Security (Fire Suppression Business Unit) illustrates the sophistication of the equipment that is now available to brigades. It is the result of

*Tests have shown that the risk of trapping building occupants or firefighting personnel between the fire and the outlet vent is much lower than was originally thought and that the benefits far outweigh any potential disadvantages.*



# PPV – A breath of fresh air

a partnership exercise that involved Tyco, the UK fire service and Unifire Power Blowers. Called the DST-3P4 "Whisper", it provides professional fire-fighters with a compact and super-quiet unit that meets their precise requirements and addresses all of the

issues raised by earlier critics of the use of PPV. It more than satisfies the "wish list" of the UK Fire Brigades PPV Working Group, including being able to elevate the fan by 20 degrees and lower it by ten degrees.

The 460mm [18-inch] DST-3P4 is an

unerringly reliable unit that has the smallest possible dimensions – it will fit into a standard locker – overcoming any size concerns, without compromising performance or in-use stability. Its 96dB(A) noise output at full throttle means that it has the lowest noise level of any PPV on the market. In fact, it is the only PPV unit available that is below the 98dB(A) level where, in many countries, ear protection is compulsory.

Its new design of stainless steel frame provides a full 360-degree roll protection, and its new one-piece, four-blade Unitron propeller has been described as "virtually indestructible". The DST-3P4 also features a patented 30-position friction-lock tilting lever, step-and-go quick locking brakes, and 203mm [8-inch] off-highway pneumatic wheels that ensure easy manoeuvrability over obstacles such as stairs, steps and curbs.

It also incorporates ergonomically-designed extendable handles to ensure that positioning the DST-3P4 is both straightforward and effortless. The DST-3P4 incorporates a new Honda overhead camshaft engine and auto-

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matic ignition. Such is the robust engineering and durability that many of the parts carry a full five-year guarantee, and the unit has been tested and approved by AMCA [Air Movement & Control Association], the internationally recognised, US-based PPV testing authority.

#### APPLICATION TECHNIQUES

The successful use of PPV is also dependent on the number and positioning of the fans. Where a single fan is being used it needs to be positioned so that the stream of air is directed at the centre of the opening, with the cone of pressurised air just covering the aperture. An often-quoted rule of thumb is to position the fan the same distance from the aperture as the aperture height. It is important to ensure that the inlet opening is properly sealed in this way, otherwise it creates the risk that hot gasses and smoke may move towards firefighters.

Where more than one fan is used, these are most effective if placed in series, one behind the other, rather than side by side. The larger fan should be nearest the building – about a metre

[three feet] from the opening – with the smaller fan immediately behind, sealing the aperture. With larger openings, it may be essential to place the fans side by side, although this is less effective and it is preferable to reduce the size of the opening if at all possible.

It is, of course, essential to create the outlet vent before engaging the PPV fan or fans. Ideally, this should be slightly less than the size of the inlet opening as this helps to ensure a build-up of positive pressure in the building. This may well call for other apertures in the building – doors and windows – to be closed. Under no circumstances should the jet positioned at the outlet vent direct water into the building while venting is taking place, as this could put firefighters inside the building at considerable risk.

Of course, many fires are in buildings that have more than one room, floor or enclosure. In such instances, the appropriate technique is to adopt what is known as a sequential approach. This involves providing the maximum volume of pressurised air to ventilate each enclosure in turn. This will inevitably

mean manhandling the PPV equipment along corridors or up staircases and is why, if for no other reason, weight and manoeuvrability of the equipment is so important.

#### CONCLUSION

It is evident that there is a compelling case in favour of the use of PPV. This is particularly so following the introduction of the latest equipment that overcomes all of the earlier concerns and today's greater understanding of the need for training and fire scene control and communication.

This appears to be a view shared by many firefighting professionals. In a recent survey of brigades in the UK, all seemed to agree that PPV is the most effective method of ventilation, and this view was also held by brigades that do not have the equipment. Undoubtedly though, all would also confirm that the key to its successful use is to consider at all times that PPV is part of a well organised and coordinated fire ground operation.

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# HELMETS ROUND UP

## CROMWELL HELMET OFFERS DUAL CE CERTIFICATION

The Cromwell F600 firefighter's helmet system offers dual CE certification for both the helmet and face shield – a vital reassurance that in active service it will properly protect the head and face – the firefighters most vulnerable areas.



Designed and manufactured in the UK by Helmet Integrated Systems, the F600 combines a stylish, compact design with superb levels of comfort in a unique modular configuration that adapts to suit individual operating requirements.

Three versions of the F600 can be selected with the option to upgrade at any time using easily replaced components: helmet only, helmet plus face shield and helmet plus face shield with face shield cover assembly. All models are fully compatible with the most commonly used breathing apparatus.

This modular approach significantly extends the service life of the helmet since damaged components can be quickly substituted for new ones without compromising performance – a key factor in the F600's low cost of ownership.

Another key factor in the F600's popularity is its wearer comfort with the ability of the lightweight, one size helmet shell to be easily and quickly adjusted to fit individual head shapes and sizes.

The Cromwell F600 is now used by 26 of the UK's fire services including the London Fire & Civil Defence Authority and is enjoying overseas success as the helmet system of choice for fire services in Ireland, Belgium, Germany, Italy, Spain, Denmark, Switzerland and Brunei.

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**Helmet Integrated Systems Ltd.**  
Tel: +44 (0) 1462 478014  
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Email: bgaskell@helmets.co.uk

## DRAEGER FURTHER ENHANCES PERSONAL PROTECTION WITH NEW FIREFIGHTING HELMET

Featuring a hard, heat resistant outer shell and a soft, fireproof inner, the new Draeger HPS6100 Firefighting Helmet offers high levels of protection under extreme fire conditions. Utilising a modern suspension system made from non-flammable, washable Nomex, it is light in weight and is available in different colours with a wide array of accessories.

Ideal for use in industrial, chemical and domestic firefighting applications where flashovers, high temperatures and chemicals may be involved, the helmet is also suitable for extended wear applications.

The strong, dual shell construction incorporates a Duroplast GFK (fibre glass strengthened plastic) outer shell, which is both self-extinguishing and resistant to heat, chemicals and UV radiation, and a soft, inner shell which is shock, heat and penetration resistant. Easily adjusted to suit different head sizes, it also benefits from an Aramide head harness complete with high-temperature resistant buckles and a 3-point chin strap, as well as Nomex/Kevlar neck and head protection.

In addition, the new Draeger patented Supra-Adaptor ensures a quick and easy fit to Draeger masks, and the clear, polycarbonate visor offers a wide field of vision with double-sided, scratch resistant coatings and ballistic protection. Ensuring excellent ventilation and optimum hearing, the external "flared" shape also enables phones and radios to be used under the helmet without diminishing protection levels.

*Further information is available from:*  
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and now with specialist space centre launch platforms.

The SOLOvision FIRE has been well received since its launch last September and is still the only camera under 1kg (weighing 650g). The Vision can be used as a hand held or as a fully integrated hands free model and has the unique ability to create a seal with the face mask to prevent any smoke, steam or dirt interfering with the picture display.

The Evolution of the Vision is the SOLOvision Hand Held. This camera operates on 6 x AA batteries mounted underneath the camera. The SOLOvision Hand Held has adjustable side straps and weighs only 850g, still the lightest hand held available. As with the Vision FIRE, the HAND HELD is designed for Brigades operating on a tight budget.



An additional benefit is the size of the "display" seen by the user. Traditional cameras provide only a 3" up to 5" square display.

All GB SOLO cameras operate with a patented display system. GB Solo takes the image from the camera sensor and processes it, using a Virtual Reality computer, so that the image presented to the user's eyes is 1 metre square and is augmented with the users head so that what the user sees is as though he/she were using their own eyes rather than that of the camera.

All cameras have the option of colour display, spot temperature and wireless transmission. All cameras are IP67 drop and water immersion approved and can withstand flash over of 1000 degrees for 10 seconds.

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Talisman Wasp

# ISG THERMAL SYSTEMS LTD

ISG Thermal Systems Ltd is the world's leading manufacturer of thermal imaging cameras. Founded in 1991, the company operates from its Head Office at Basildon, England, and has subsidiary companies in Atlanta, United States, and Beijing, China. With sales to fire brigades in over 60 countries throughout the world, An example of this is that ISG supply thermal cameras to over half of the United Kingdom's 62 public fire brigades.

ISG's current models include the popular Talisman Wasp with x2 Zoom providing a

clever magnified screen image. Other features of the Talisman Wasp include a Visual Overlay to provide more information about the surroundings inside a smoke filled building, accurate and fast temperature measurement and built-in video transmission. After extensive evaluation trials, the Talisman Wasp has recently been selected by the London Fire Brigade, which has now taken delivery of 100 units for use by the capital's firefighters.

At the new Severn Park Training Centre (jointly used by Avon, Somerset and Gloucester fire brigades), Talisman Wasps are used in the live-fire training buildings to transmit thermal images to the remote training building control room. This installation uses an FM transmitter and is believed to be the first of its type in the United Kingdom. ISG collaborated in the design and application of this important safety feature at this new training centre.

ISG's new generation of miniature TIC is the ultra light-weight, super tough Spirit. Despite its small size, the Spirit has a powerful performance and specification, including built-in temperature measurement and video transmission. Weighing only 1.2kg (2.5lbs), the Spirit uses the Force fire bolometer, a combination of the latest generation microbolometer infrared detector and advanced signal processing. It is a fully automatic TIC which switches

on ready for operational use in five seconds. The Spirit uses either rechargeable NiMH or alkaline batteries and with 'easy load' battery packs can operate for up to seven hours of operational use. The Spirit also has a unique world first 'action grip' which enables the user to simultaneously hold the TIC and other tools in the same hand.

The latest ISG miniature firefighting camera is the Elite. This has the latest powerful microbolometer performance giving a high brightness LCD colour display that all the firefighting team can readily see. With an infrared vision field of 54 degrees, the Elite is fully automatic in operation, has an unrivalled operating time and is proven firefighter tough. The Elite has an electronic zoom facility, audible low battery alarm and a video transmitter.



Talisman Elite

These ISG thermal imaging cameras clearly illustrate ISG's technical design expertise and commitment to the future. ISG Thermal Systems can be justly proud of its contribution to the development of thermal cameras for firefighting and rescue work in many countries around the world.

The successful use of TIC's has undoubtedly made a significant contribution to safer and more effective international firefighting. Thermal cameras have indeed come a long way since their first use of the heavy and unwieldy first generation units over 20 years ago, and who can foresee what further innovative developments are yet to come.

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Talisman Spirit



# High Rise Rescue Operations

By John Ng  
Escape Consult Mobiltex (S) PTE. Ltd

Picture courtesy of Escape Consult Mobiltex (S) PTE. Ltd

in the market that provides dual functions in one unit portable rescue chute. This equipment allow the rescue personnel to quickly deploy and put to use under adverse conditions when space, speed and mobility are essential for mass rapid height rescue operations:

- The quick deployment of mobile rescue unit and its flexibility of extending or shortening the chute length to the desired height for the rescue allow the rescuers the speed to quickly provide victims a safer means of rapid vertical escape from bucket to ground. It eliminates the time involved in lowering and raising the aerial platform, and reduces the speed of mass rescuing victims from tall building by almost ten times in comparison to using the conventional method. Thus improves the evacuation capacity of any aerial ladder/hydraulic platform of fire engine



Picture courtesy of Escape Consult Mobiltex (S) PTE. Ltd

NO FIRE AND EMERGENCY Services Department likes to contemplate the possibility of a high-rise fire. While most building management have a procedure for evacuation which is not dependent on the fire brigade, however, if the system fails then the fire brigade will have to come to the rescue. When incidents involving high-rise rescue operations, it can become a dangerous affair of protecting and saving the property and lives. For this reason the provision of means of dealing with such incidents must assume at all times the possibility of, and need for, height rescue and extinguishing a fire at any time during rescue operations.

## HEIGHT RESCUE EQUIPMENT

Traditionally, the rescuers from the Fire and Emergency Services Department are highly trained men to accomplish difficult and complicated height rescue operations in rope access techniques for high angle rescue. However, high angle rescue techniques and super-high aerial ladders employed yesterday can soon become obsolete or irrelevant in today's built-up environment as high rises progressively penetrating further into the skyline.

Today's firefighter is faced with not only a bewildering array of difficult and complicated high rise rescue operations but also choosing the most efficient

height rescue equipment for firefighter safety. The most important factors are the efficiency of the equipment and the speed with which personnel and equipment designated for rescue purposes can be efficiently put into use.

## TECHNOLOGY AND INNOVATION

The industry in fire and rescue equipment has a fine tradition of being innovative and creative. The mobile/portable rescue chute mounted on the bucket of hydraulic platform or aerial ladder of fire truck is an excellent example of the industry's innovative and creative outlook – of how to think and do beyond the conventional. It is one of the most vital pieces of height rescue equipment



from 10 to 100 times. In addition, it is able to evacuate over 100 people in 10 minutes, including the handicapped.

- Should the surrounding of the building site could not accommodate the fire aerial truck, the portability and versatility of the rescue chute allows the rescue personnel to carry the rescue unit to the desired floor. The universal platform has a pair of bolts that serve as hangars that can hang on the handrail of the balcony within minutes for ready use. In situation where there is no handrail on the balcony, with the additional equipment (horizontal arms and vertical legs), it allows the rescue chute to be positioned at the parapet of balcony and window for quick rescue use.
- The chute main body material is constructed of three layers chute. This 3-way protection protects the evacuees once inside the chute from flame, heat, and smoke during rescue operation. The system works on the principle of gravity, using the stress and friction on the body as it slides down. Usability for all people, regardless of body size, shape and weight, injured on stretcher and unconscious people can use the chute to arrive at ground level quickly and relatively safely.



Picture courtesy of Escape Consult Mobiltex (S) PTE. Ltd



Picture courtesy of Escape Consult Mobiltex (S) PTE. Ltd

### HIGH RISE EVACUATION

The super-high aerial ladders are not the sure way out of a burning high rise as they have their limits – they can extend to 52 metre, or 18 storeys. When incidents involving high-rise rescue operations beyond the reach of the height rescue equipment, it can offer a wide range of new and deadly problems for firefighters and the evacuees. Hence, the safest thing for building occupants to do in a high-rise fire is to head for the nearest staircase on the floor to avoid being trapped and make their way out of a blazing high rise.

Mass evacuation in a high-rise scenario offers a wide range of problems for the building management. It is important to realize that in the context of high-rise evacuation, there are people among the building population who may have difficulty or no ability to walk down stairs unassisted during emergency evacuation. The scenario may become even more complicated for the fire fighters when some of the occupants are trapped above the fire floors and that the stairwells are impassable because of smoke, heat or flames.

Just as we accept the daily use of elevators to gain access to every floor in high-rise buildings, so too there are ways that must be taken to ensure that all building occupants can also get

down and out in the absence of elevators during emergency evacuation. Future tall buildings would need to provide another means of safer egress to facilitate speedier evacuation that allows all people, include those who have difficulty or no ability of using stairs to get out of building in extreme emergencies. Such an emergency exit system for everyone would simultaneously grants occupants their right to evacuate, maximize the escape potential of the elderly and people with disabilities while giving priority the firefighters to focus on fire suppression.

### CONCLUSION

Fortunately, rare occurrence of major hazards in high rise buildings means that more often than not, the real-life experience of high rise rescue, mass evacuation and evacuating people with disabilities under urgent circumstances is not tasted. But when they do occur, a safe strategy would be to get as many people evacuated out of a blazing high rise in a predetermined evacuation plan than having to depend on firefighters to perform height rescue operations. This approach is the only acceptable way in guaranteeing life safety prevention.



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# Reusable versus limited use protective clothing



*Trellechm limited use suit*

THE SELECTION OF CPC IS A COMPLEX TASK. A number of articles have been published and some guidance documents are being prepared by CEN and NFPA but it still is not a simple task. Literature and regulations emphasise risk analysis including state of the chemical, type of exposure and a clear definition of the chemical and other types of hazards.

This is definitely the right starting point but how often is it done properly and to the full extent that it is intended? Further, is it always as easy as it seems in theory? No, often it is not. For fire and rescue services, "emergency/hazmat teams", you have to be prepared for a wide range of different scenarios involving practically any chemical in any state (gaseous, liquid, solid including liquid and solid aerosols). Also for industrial use there is often a wish to be able to use advanced CPC not only

By Ulf Nystrom

for one clearly defined task but for many different types of operations and, on top of that, it should be possible to use also if an emergency should arise. Perhaps one that necessitates crawling on your knees, getting caught on objects, possible contacts with a hot surface or flame etc. Now it gets complicated. You will be left without answers if you ask for one single type of protective clothing to protect from everything. Further, which is the better choice between limited use and reusable? What are advantages and limitations of each? Is the comparison of reusable and limited use CPC only a matter of economics and what are the economical facts when comparing the two? Is there guidance available from standards and regulations when selecting CPC and, if so, what does it tell us?

## DEFINITIONS OF REUSABLE/LIMITED USE

Unfortunately there are no internationally accepted definitions available that draw a clear and strict line between the two types. However, there is a technical report with definitions (ISO/TR 11610:2001) made by ISO (International Standards Organization) that is also implemented within CEN (the European standardisation organisation).

Regarding limited use CPC it says: "Chemical protective clothing for limited duration of use, i.e. to be worn until hygienic cleaning becomes necessary or chemical contamination has occurred and disposal is required. This includes protective clothing for single use and for limited re-use according to the information supplied by the manufacturer."

Regarding reusable CPC it says: "Reusable chemical protective clothing that is constructed from materials which allow the clothing to be cleaned after repeated chemical exposures such that it remains suitable for continued use."

One would have liked the definitions to be more exact and point out some criteria that are easy to apply to all products on the market. Let's just make a note of the fact that it mentions hygienic cleaning and chemical contami-

nation when defining limited use. Those are certainly limitations. I will try to clarify more limitations and differences between the two types of clothing below by looking at their different properties and referring to the few standards and regulations that are available.

## CHEMICAL PROTECTION

It is quite obvious that there is a need for the CPC to provide good protection from a wide range of chemicals. What do the standards require? The European standard, EN 943-1, specifies no test chemicals. However, part two, EN 943-2, CPC for "emergency teams", specifies a list of 15 chemicals. Further, EN 943-2 requires testing to be performed on gloves, boots and visors in addition to suit material and seams. The minimum requirement is a permeation breakthrough time of 30 minutes (as defined by a permeation rate of  $1.0 \text{ mg/cm}^2 \cdot \text{min}$ ). Actually, down to 10 minutes is accepted if there is a warning in the manual. From a chemical point of view the standard is not extremely tough.

The American standard NFPA 1991, Vapour-Protective ("gastight" or type 1 in Europe) Ensembles for Hazardous Materials Emergencies, specifies a list of 21 chemicals and is tougher here in many respects. One point is that the breakthrough criterion is a permeation rate of  $0.1 \text{ mg/cm}^2 \cdot \text{min}$ , i.e. ten times stricter than in Europe.

## MECHANICAL REQUIREMENTS

By a quick look at the chemical requirements it would seem the standards are not extremely tough and that there would be a lot of products certified to be adequate for emergency response. I don't mean to say that the chemical requirements are too low. The specified chemicals are chosen to represent the most aggressive one of each kind in terms of permeation. There is a number of CPC both reusable and limited use, which fulfil the basic chemical requirements. But if we move on to look at the other requirements the situation is a bit

\*NFPA 1991 approved i.e. with overcover

# Limited use chemical protective clothing (CPC)

different. There are other requirements and this is an important point.

Obviously the CPC is of little use, even if used only once, if it does not withstand some wear and tear. This is taken into account in EN 943-2 which specifies minimum requirements for mechanical properties above those in the EN 943-1. There are two sets of minimum requirements with one set on a lower level for limited use suits.

The need for adequate physical properties such as strength, resistance to abrasion etc is made even clearer in the American NFPA. The NFPA 1991 requires the material samples to be flexed and abraded before permeation testing. In that respect the NFPA 1991 is the only standard that really takes into account that the chemical barrier is there also during the stress, flexing and abrasion etc of actual use in the real world. However, this requirement excludes the limited use plastic laminate suits. That is unless they are provided with an aluminized overcover which protects the barrier material. Unfortunately, it is a widespread misunderstanding that the cover is there for additional flame protection and is not required if there is no flame hazard. This has led to many cases in America with response personnel responding to incidents with CPC not fulfilling the basic protection requirements.

It is possible to meet these requirements without any additional protection by using some of the modern reusable CPC available on the market today.

Germany used to have their own set of regulations for CPC for fire and rescue services. However, over the last years they have fully adopted the European

standard EN 943-2 into their national regulations. The German Vfdb 0801 now refers to EN 943-2 for test methods and requirements but there has been made a distinction between CPC for the actual emergency response and more simple support tasks of lower risk outside the hot zone ("begrenzten Einsatz") e.g. supervision and roping off areas etc. In order to fulfil the requirements for full emergency response the higher performance requirements of EN 943-2 for reusable suits are applied. The use of limited use suits is only allowed for "begrenzten Einsatz" as above.

Table 1 below further illustrates the different levels of strength and durability provided by some typical limited use and reusable CPC. Perhaps the difference in strength is not the most interesting point but the flex cracking. Flexing of the suit material occurs just by donning, doffing and walking around in a suit. This certainly sheds more light on the limited use concept. A safe interpretation of this concept would be single use or disposable regardless of the suit having been contaminated or not.

## HEAT/FLAME REQUIREMENTS

What about flame/heat resistance? CPC will never offer real fire protection; this is an important fact to remember. Still, a reasonable requirement would be that it is at least not made of a highly flammable material and that it would be self-extinguishing within reasonable circumstances. At least, you do not want to be turned into a walking torch if accidentally exposed to a flame.

The limited use suits in general burns very well and are not self extinguishing



*Trellechm limited use suit with aluminized cover required for NFPA approval*

but will continue to burn once ignited. There is also a risk of dripping and formation of burning pools. Most commercially available reusable types of CPC have some degree of flame resistance and some exhibit self extinguishing properties.

EN 943-2 allows three different levels of flame resistance, the highest being a simple 5 s flame test. None of the traditional limited use/plastic laminate suits fulfil this class.

In America, the NFPA 1991 also specifies a flame test but it is somewhat tougher than the European (it is a 3+12 s flame test) which is another reason why limited use suits either cannot be approved or must be used with an additional cover.

The reasons for the emphasis on mechanical strength as well as some basic degree of flame resistance are quite obvious for emergency/hazmat teams of different kinds. Even if you do not normally crawl on rough ground what if you would have to? Even if you don't crawl or perform heavy physical

**Table 1.**

	Reusable 1 Elastomeric	Reusable 2 Elastomeric with barrier	Limited use 1 Plastic laminate	Limited use 2 Plastic laminate
Tensile strength, N ISO 9073-3	1200	1500	300	270
Flex cracking, cycles ISO 7854 B, flexing until leakage	> 100 000	> 50 000	< 5 000	< 5 000
Flame resistance, EN 943-1 class 3 (5s)	Yes	Yes	No	No





Trellechem reusable suits

work, just walking around means flexing of the suit material.

There are not many studies available that provide statistics of incidents involving failing CPC and the modes of failure. However, discussing this issue with people around the world it seems most incidents involves mechanical failure of the clothing and not to permeation of the suit material.

Of course, the first selection criterion should be a high level of chemical protection from a wide range of chemicals. Having seen to that, you need to make sure that the protection is there during the mission even if it should mean crawling on a rough surface, stretching a seam or an accidental contact with a flame or hot surface.

DECONTAMINATION

The decontamination of reusable CPC is discussed from time to time and is sometimes said to be problematic. It certainly requires some chemical knowledge and one problem is that the proper method of decontamination has to be determined for each specific chemical or, at least each type/class of chemical. On

the other hand experience from both industry and fire and rescue services shows that the problems are not that extensive. A lot of aggressive chemicals permeates very slowly and is readily washed off with large amounts of water with some detergent added. This will apply to many inorganic and also some organic chemicals. The problems with decontamination are often supposed to concern small molecule organic liquids which are known to permeate many CPC materials relatively quickly. This is, however, usually the least problem because the process is reversible and the faster it permeates the faster it will evaporate out of the material again.

Looking at limited use suits there is sometimes a misconception that the limited use suits never need to be decontaminated and that they may simply be thrown away after use. This is not quite so simple. The first decontamination must always be performed in order to assure safe doffing for the man inside. Further, contaminated CPC must be put in a suitable container and sent, in a safe way, for destruction. Many times, that is neither simple nor cheap.

Table 2.

Cost	Product #1: Disposable*	Product #2: Reusable	Comments
Purchase	\$900	\$1,950	
Decontamination	\$50	\$250 (five uses)	Includes labour and consumables for both types
Maintenance	\$50	\$250 (five uses)	Each suit must be pressure tested upon receipt
Storage	\$25	\$25	Proportional to bulk – same for both types
Disposal	\$25	\$25	Proportional to weight – same for both types
Subtotal	\$1,050	\$2450	
Number of uses	1	5	
Cost per use	\$1,050	\$500	

A detailed method for estimating chemical protective clothing life cycle cost is provided in Schwoppe and Renard, "Estimation of the Cost of Using Chemical Protective Clothing," Performance of Protective Clothing: Fourth Volume, ASTM STP 1133, James P. McBriarty and Norman W. Henry, eds., ASTM, Philadelphia, 1992, pp. 972-981.

ECONOMY

Purchasing top level (whether you call it level A or gastight/type 1) CPC is an investment. It is important to get the most out of this investment both from a safety as well as an economical point of view. Limited use suits are cheaper. Or are they? What is the total cost of using limited use/disposable versus reusable CPC over its life cycle? Table 2 refers to an American study but in principle it is applicable anywhere in the world.

Since reusable suits can be in service for several years, the initial investment can be expensed over the suit's usable life. Hazmat/emergency teams may back-charge for wear and tear using a calculation method similar to the one shown below. It is important to make this estimation and comparison of the real costs in order to get the whole picture and how to get the most of your investment.

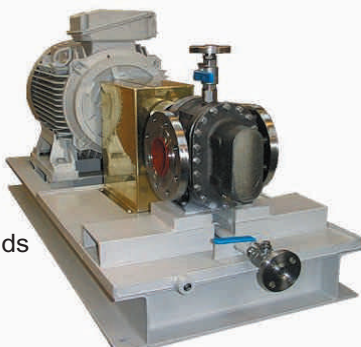
Perhaps you can find cheaper limited use suits in Europe. Perhaps slightly but we are comparing approved CPC for emergency response here. The European standards requires limited use suits (type 1aET or 1bET) for emergency response to be fitted with additional hump protection, fitted boots to be certified fireman's boots (EN 345 FPA) and a permeation resistant zipper which is quite different from the standard zipper (especially price wise) and all these things adds to the price so the general conclusion would apply also outside the US. At any rate it is important to make an estimation of the true life cycle costs before making an investment.

CONCLUSIONS

Choosing CPC for fire/rescue services or for dealing with accidents or complex tasks within industry is difficult because of the difficulty to foresee all possible scenarios and hazards. This means it is important to be as safe as possible, not only looking at permeation data. It is important to take all aspects of what is really provided and not provided by the limited use and the reusable concept into account. The choice is not a question limited to economy but concerns performance and safety. Remember that dealing with these complicated issues there is some guidance available from standards. Put safety first. When it comes to economy remember to make a proper analysis of your true costs.

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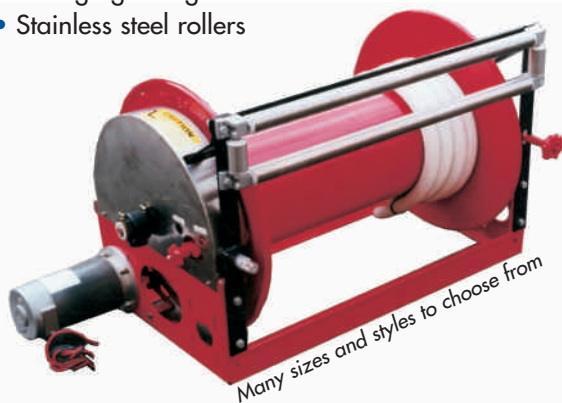
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We know, that various devices and machinery are applied for human saving and disaster-management actions. However, in our hi-tech world we tend to forget that all this machinery is worthless without the strength and efforts of the men and women using them. These devices are simply the tools used to accomplish a better job and improve efficiency.

### PPC should not only be protective – it should be functional as well

All physical activities require strength and movement. This movement, especially for a fire fighter in the line of duty, produces heat and heat, coming from the body, naturally produces moisture and perspiration. To keep the body at an optimal temperature, allowing for optimal performance, PPC must lift moisture away from

the skin allowing the body to maintain an optimum temperature.

### The Process

*PPC lifts and absorbs wetness, transporting moisture away from the skin and support the evaporation of perspiration.*

Research has proven, that using functional PPC increases the efficiency and effectiveness of the wearer. Having a dry and comfortable feeling on ones skin enhances ones performance in any type of situation. Clothing which does not take these factors into consideration can lead to fatigue or mental distraction of the wearer increasing the probability of occupational injuries – not forget to mention the possibility of heat stroke resulting from heat stress. Not taking these factors into consideration can create a hazardous situation for both the individual and their team.

### Using and understanding the fibres and their properties

Any PPC coming into contact with fire or heat must be flame resistant but it must also be comfortable and able to absorb moisture. Achieving the required effects requires the uptake and lift of moisture. Therefore, functional clothing always consists of two fibre components, one which absorbs and hold wetness away from the skin and one which remains dry creating a feeling of comfort to the wearer.

There are many High Performance Fibres existing on the market (Meta Aramides, Para Aramides, Polyimide, Poly Amid Imid, PBI-fibres, etc.) which are used for this application. These fibres have been proven to be excellent in respect to their flame resistance performance but their lack of moisture removing capability limits their functionality.

There is another fact, which should taken into consideration when purchasing PPC. Some of the High Performance Fibers (Carbon-, Aramide- Fibers,) lead the heat to fast through the garment onto the skin. Especially for Hoods or garments which



Nomex hood

are worn directly on the skin functionality and insulation is a very important issue.

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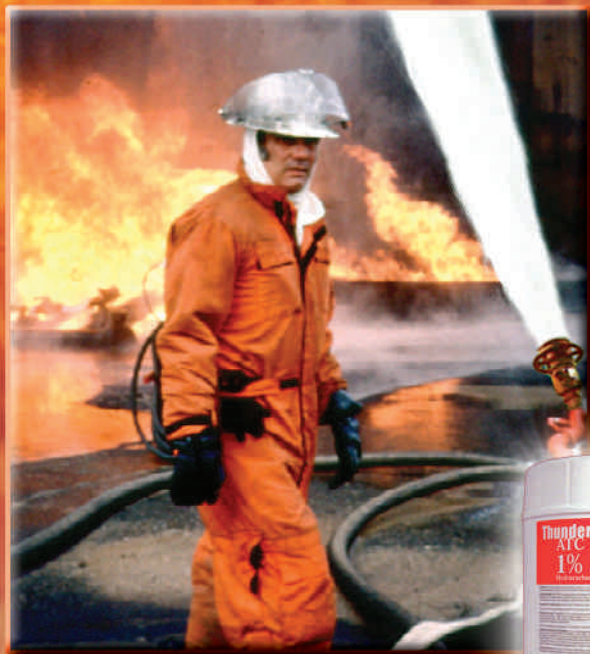


**Industrial**





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## CASE STUDY

# Guatemala Storage Tank Fire

By Eric Lavergne, Williams Fire & Hazard Control, Inc.

*Pic courtesy of Williams Fire & Hazard Control, Inc.*

## THE INCIDENT

On Saturday July 26, 2003 a hydrocarbon storage terminal in Guatemala suffered a lighting strike in one of their 95' diameter storage tanks. On Thursday July 24, the facility transferred gasoline into a cone roof tank. The storage of the gasoline was going to be temporary and the decision was made due to the facility storing at maximum capacity. The facility met all applicable design criteria for NFPA 11, regarding protection of their fuel storage tanks, and were utilizing a pump driven balanced pressure system with separate water/foam solution lines installed at each tank.

The first initial attack was attempted utilizing the fixed system. The system's 1500-gallon atmospheric foam concentrate tank (3% F.P.) was depleted during the attack with failure to extinguish via the fixed foam chambers. We were notified at 5:00 A.M. on Sunday July 27, 2003 and a team of 5 fire fighters was deployed to the facility. Finding an aircraft large enough to haul the required equipment to make the attack proved to be difficult. During the initial conversation it was reported that firewater reserves were consumed (200,000 gallons) and a portable firewater pump would be required. A C-130 transport aircraft was located, however it would require a 14-hour window in order to fly it in, load it and arrive in Guatemala. Our crew arrived on Sunday night at approx 5:00 P.M. After sizing up the incident it was noted that several pumps located at the

site could replenish the firewater tank and then be utilized as "make-up" water during an attack. The facility personnel were able to fill the foam concentrate tank with additional 3% F.P. and the decision was made to attempt another foam attack. Foam was applied until it was running out of the vents as well as the "fish mouths" located at the weak roof to shell seam. There was not a tank available with proper outage to allow product transfer from the burning tank. Water lines were deployed in an attempt to extinguish the burning vapor emitting from a single remaining vent. As the foam was pouring out of the tank it was obvious that the foam blanket had trapped a considerable amount of gasoline vapor. As a result the foam blanket in the diked area ignited (no hydrocarbon liquid escaped from the tank). The saturated foam blanket burned for a brief period (5

mins.) in the dike area until the fuel-contaminated foam blanket was consumed. After this the decision was made to halt all operations until the equipment and foam concentrate arrived. The following day we staged for another foam attack. The foam blanket once again was going to be applied via the foam chambers. The 1%-3% ATC/AFFF that was going to be utilized required an orifice modification on the existing foam proportioning system. In addition to the foam chambers, three 125-gpm-foam wands were deployed in various vent holes in the tank. Portable monitors (Dasptit Tools) were also deployed to "scrub" the vapors emitting from the tank roof openings with the ability to convert to foam. Two HydroChem hand lines were positioned, one on the landing of the burning tank and one on a adjacent tank, in the event the vapors continued to burn at the tank roof openings.

The foam attack was initiated at approx. 8:15 P.M. July 28, and flame collapse began shortly thereafter. All fire was extinguished with the foam blanket and three of the vents were "shot out" utilizing dry chemical in conjunction with Hydro-Chem' technology. At 8:45 P.M. no visible flames were present. Cooling of the tank roof continued for a predetermined period of time with intermittent foam applications. The following morning, the tank



# Guatemala Storage Tank Fire



was inspected and recommendations were made for the transfer of the gasoline.

## THE DILEMMA

To understand the problem associated with this incident we must first look at the factors that exist on burning fixed roof and covered floating roof tanks. If the floating roof has sunk or improper storage of fuel, (as in the incident described above) the result will be full surface fuel exposure. The parameters of the vapor space will impact the damage to the tank accordingly at the time of ignition. If the vapor space is in the flammable range a vapor air explosion will normally occur in the tank. If the outage is significant, damage at the weak seam is likely or the loss of the total roof is not uncommon, resulting in a full surface tank fire.

If the vapor space is in the flammable range at the time of ignition, but the

outage is minimal or the vapor space is rich, fire at the vents is normally the result; the later describes the incident in Guatemala. Although the full surface is not covered the vapor space inside the tank is too rich to burn. The flames occur once the vapor leans out with atmospheric air as it passes through the tank vents (see photo).

Once the system is deployed via the foam system's chambers the foam enters the vapor rich atmosphere and begins to flow across the surface, during the process the foam blanket entrains large amounts of flammable/combustible vapors. This is what caused the foam blanket to burn in the diked area. What must be considered is the vapor space above the blanket; the foam blanket will suppress and prevent the yield of additional vapors, however, the vapors that were present remain above the foam blanket. The vapors

travel through the vents (in this case 10ea. 18-inch.) and mix with the air and burn. The volume of burning vapor is miniscule; the 4-foot of outage in the Guatemalan tank fire was roughly 42,000 cubic feet. Based on the vapor pressure of the product and the 10 ea. 18-inch vents, the vapor duration could easily last for over 12 hours. The foam blanket will break down long before the vapor is depleted, and the process starts all over again, and the facility depleted the foam supply.

If by chance a company is able to produce a foam blanket with the long duration to provide vapor suppression throughout the ordeal creates a problem that could escalate the damage already suffered in the incident. If the foam blanket prevents the vapor yield and the fire is consuming vapor, the vapor inside the tank will be displaced with atmospheric air via the vents. As the vapors continue to be consumed the vapor space continues to lean out until the point it reaches the flammable range, at this point a vapor air explosion can occur resulting in the loss of the roof and a full surface fire.

Either of the two results are negative. What must be realized is that the systems as we know today must be augmented to handle the scenario. Options that could assist the system:

- Inert Gas
- Steam
- Halon Replacements
- Dry Chemical

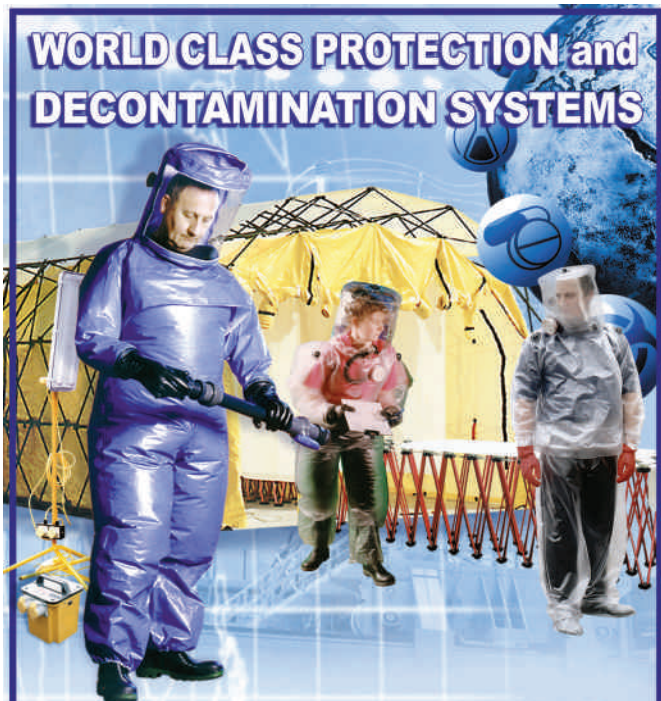


Pic courtesy of Williams Fire & Hazard Control, Inc.

All will work but availability is a consideration, dry chemical would be a good option, as total flooding should not be required, it's inexpensive and readily available. Dry chemical could be discharged into the vents via portable discharge system or piped to a twin agent foam chamber during installation. Reduction of dry chemical particle size will allow for a greater suspension of dry chemical in the vapor space. The suspended dry chemical would follow the path of the flammable vapor and exit the vents. There is still work to be done regarding system design; chemical etc. but understanding that the current designs have a deficiency will guide us in the right direction.



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# PPS PRODUCT PROFILE

WHETHER THE CUSTOMER is a provincial fire team, seeking entry-level decontamination technology at the traffic incident level or a national government looking to update its mass-decontamination capabilities in the face of the threat of global terrorism Professional Protection Systems have the equipment and, just as importantly, the training programme, to suit specific customer needs.

The UK based company, which exports to 50 countries through its network of dealers and its own European sales team, is unique in being able to offer both types of decontamination shower that currently dominate thinking world-wide on decon technology; inflatables and articulating frame technology.

PPS have developed an impressive range of variants to the standard inflatable unit since they first introduced the concept to the world's fire services in 1996 in the wake of the Tokyo Sarin incident. The units come with a range of PPS developed options and accessories, such as water heating systems, internal raised flooring and, where desired, box trailers for transportation. Important PPS features which are not only performance enhancing but cost effective include disposable liners for use inside the showers. Their use obviates the need to decontaminate the unit after use and rapidly gets it back in readiness for the next incident. Other features include separate entry and exit doors to minimise the chances of cross contamination of casualties and emergency services personnel and provision is made for the containment of all contaminant within the unit prior to environmentally safe disposal.

Although several inflatable modules can be linked together to form a single unit it became clear to PPS that these

were not the units to manage the kind of large scale incident that has become the nightmare scenario for practically every government and every emergency service throughout the world. It was for this reason that PPS have introduced a mass decon unit that works on a patented articulating frame technology sourced by PPS in the USA. These new units that can handle 200 ambulant casualties per hour can be made ready for action within five to 15 minutes and are so designed as to remain absolutely stable even in winds conditions of 50 mph. Within the footprint of one of these units it is possible to carry out the complete decon routine – undress, shower, wash and rinse followed by drying and dressing. These new units have many features, including lighting, warm air heating, hot water supply, contaminant containment systems as well as the capacity to provide separate male and female facilities. To avert the build up of gas or vapours a continuous flow of thermostatically controlled air moves

throughout the unit. All floor surfaces have an anti-slip finish. Manufactured from recycled plastic materials these inhibit contaminant growth and development and lend themselves to easy cleaning.

End users of both inflatable and articulating frame units are also faced with an every increasing array of accessory options. For instance the entry-level inflatable for Hazmat incidents currently can use no less than 14 accessory pieces of equipment. To enable end users to make an informed choice, both in terms of performance and cost, PPS have recently set up a Technical Operations Support facility dedicated to finding the right solution to individual customers equipment requirements.

With a portfolio of global customers in the decontamination shower sector ranging from the French, UK and Italian Governments to the Japanese Defence Force, the USAF and the Czech, German and Hong Kong fire services, to name but a few, the fact that PPS is also a major designer and manufacturer of top end PPE tends to be forgotten. In fact PPS recently introduced the first dedicated range of protective suits for decon incidents. The range includes an incident control (cold zone) suit, a full decontamination suit and NBC escape suit and a training suit. The last simulates the wearing characteristics of the others in the range but at a much lower cost.

Further information about the above products and others in the PPS range can be obtained from:

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*The units come with a range of PPS developed options and accessories, such as water heating systems, internal raised flooring and, where desired, box trailers for transportation.*



# ARFF Developments Needed for Super-Size Aircraft



*Pic courtesy of E-One*

AS THE NEXT GENERATION of super-size commercial aircraft get ready to leave the drawing boards and take to the skies, airports around the world are busy making preparations for their arrival. Along with tackling the problems associated with the sheer physical size and weight of these new aircraft, airports are also evaluating how to provide adequate aircraft rescue and fire fighting services for the larger planes. Part of the solution may be a new generation of larger ARFF vehicles with new features, equipment, and tactics.

## NEW AIRCRAFT

The immediate focus of all this activity is the new Airbus A380 aircraft, which is currently expected to enter service in 2006. The first model of the A380 family will be the A380-800 with a capacity for 555 passengers. A future stretched version will carry 656 passengers. For comparison, the present-day Boeing 747-400 carries 430 passengers.

Passenger seating on the Airbus A380-800 includes first-class, business-class, and coach seating sections arranged on two decks. The main deck cabin is 49.8 meters (163.5 feet) long. The upper deck cabin is a full 47.3 meters (155 feet) long. Both decks have exit doors on each side. Interior staircases in the front and rear of the aircraft connect the two decks for normal passenger movement during flight. The lower baggage deck has two sections,

one fore and one aft of the wing, each with a single door.

As you might expect, an aircraft with such a large passenger capacity has equally large overall dimensions. The



*Pic courtesy of E-One*

length of the A380-800 is 73.0 meters (239 feet), and the wingspan is 79.8 meters (262 feet). The maximum fuselage width is 7.2 meters (24 feet), and the tail fin soars 24.1 meters (79 feet) above the ground. Any way you look at it, it's a big plane. The maximum on-board fuel capacity is about 310,000 liters (82,000 US gallons), although most flights would typically carry less.

A freighter version of the A380, known as the A380F, is expected to go into service in 2008. It will be able to carry cargo in standard pallets on three decks and is specifically designed for express freight companies who want to extend the range of their "next-day" overseas delivery services.

As of January 2004, Airbus reported they had firm commitments from several companies to purchase a total of 129 of the new A380s, including 17 freighter versions. These impressive sales figures, long before the first plane has even gone into service, clearly indicate that the next generation of large aircraft is on its way!

## ARFF REQUIREMENTS WILL CHANGE

The larger size of the Airbus A380 family means that airports handling them may



*Pic courtesy of E-One*

be bumped up one or more ARFF categories depending on which authority sets the regulations. In turn, this may require an upgrade of ARFF vehicles.

The airports that will be affected the most are those that fall under the regulations of the International Civil Aviation Organization (ICAO). ICAO sets standards for many airports outside the United Kingdom and United States, and defines ten categories for ARFF requirements depending on the overall length of the aircraft and the maximum width of the fuselage; Category 1 is the lowest and Category 10 is the highest. Category 9 aircraft are defined as having an overall length of 61 meters (200 feet) up to but not including 76 meters (249 feet) and a maximum fuselage width of 7 meters (23 feet). Airports currently handling the Boeing 747-400 are classified as Category 9. Airports that plan to handle the new Airbus A380 would get bumped up to Category 10 because the maximum width of the fuselage exceeds 7 meters.

The firefighting requirements for ICAO Category 9 include a minimum of three ARFF vehicles with a combined discharge rate of about 13,400 liters per minute (roughly 3,500 gallons per minute) and a total water capacity of 36,200 liters (9,570 gallons). The jump to Category 10 would still require a minimum of three ARFF vehicles, but the combined discharge rate would increase to 16,600 liters per minute (4,400 gallons per minute) and the total water capacity would increase to 48,200 liters (12,740 gallons).

Airports in the United Kingdom fall under the Civil Aviation Authority (CAA), and those in the United States fall under the Federal Aviation Administration

(FAA). Both organizations have ARFF standards similar to ICAO.

#### LARGER ARFF VEHICLES

So how would the change to ICAO Category 10 affect airports that fall under those regulations? The answers range from no change to a complete upgrade of their ARFF fleet with larger vehicles.

Some airports already have enough ARFF vehicles with sufficient capacity to meet the increase in discharge rate and water capacity. Others could draw on a combination of their frontline and reserve apparatus to meet the higher requirements.

More likely, most airports will opt to upgrade their fleet with larger ARFF vehicles. Some will choose to make a single purchase of two or three new vehicles from one manufacturer to ensure commonality; others may make a more gradual upgrade by replacing their older, smaller units with larger ones over a period of a few years.

Although the configuration of these new, larger ARFF units will vary according to the manufacturer and the requirements of individual airports, the new units will probably each carry

about 16,000+ liters (4,000+ gallons) of water, plus a proportionate amount of foam concentrate. The first-response units will each have sufficient pump capacity to discharge about 7,500+ liters per minute (2,000+ gallons per minute) of foam in order to bring the fire under control and protect the aircraft crew and passengers as they evacuate. The next-arriving units may have the same discharge rate, or somewhat less, and will be used to stabilize conditions or extinguish the external fire. All units will have one or more remote-controlled nozzles as well as handlines.

With all that water, foam, and equipment hurtling down the runway, it is likely that these new vehicles will be built on 8x8 chassis to support the extra weight and give good traction. This configuration also gives an even weight distribution between the front and rear axles for improved vehicle stability. Power will come from massive 1,000+ bhp diesel engines to meet the requirements for rapid acceleration and sustained top speed.

The new ARFF units will also have to be as quick and nimble across rough terrain as they are running down the runway. This will require high-capacity suspension systems to reduce the shocks and jars of off-road operation while still allowing the vehicles to "sail off the end of the runway without slowing down," as one driver put it. There are many types of suspensions that can accomplish this, but some people say that independent suspensions give the driver a better road feel than active-reactive suspensions. The addition of Davis Struts are a significant enhancement to independent suspensions and can dramatically improve handling and cornering stability over conventional struts.

And because the new large aircraft will have full upper decks and higher fuselages, upward visibility will be important in future ARFF units. This



*Pic courtesy of E-One*







## ARFF Developments Needed for Super-Size Aircraft



Pic courtesy of E-One

may require large windows in the roof and upper sides, plus individual window wipers to give the operator a clear view.

Aside from a change in pump, water, and foam capacities to meet the new regulations, individuals airports may also establish new requirements to meet their specific needs. For example, some airports are already requiring that their ARFF units carry Halotron as one of the complimentary extinguishing agents to avoid the corrosive effects of some dry chemical agents. This is especially true when dealing with engine fires, where some dry chemicals can cause more damage than the fire itself.

### DIFFERENT TACTICS

In addition to the new ARFF requirements, the next generation of super-sized aircraft may make airport firefighters consider new firefighting



Pic courtesy of E-One

tactics as well. The traditional sequence of attack usually includes firefighting personnel entering the aircraft to extinguish the fire with handlines after the passengers and crew have evacuated and the exterior fuel fires are under control. That tactic presents some potentially serious problems when dealing with double-decker airplanes with large interior volumes.

One of the considerations is entry itself — the doors on the upper deck of the Airbus A380 are about 7.8 meters (25 feet) above the ground, for example. Once inside the passenger version of the A380, firefighters would have to negotiate their way through several different seating areas on each deck, each area separated from the others with partitions, and each interspersed with galleys and lavatories. Large stairwells at the ends of the main and upper decks would allow smoke and combustible gases to circulate throughout the interior. In this environment, firefighters could become disoriented or find themselves exposed to a flashover.

On freighter versions of the A380, the problems would be further compounded by the restricted access along the length of the decks. With all three decks filled with cargo containers, a direct fire attack by personnel with handlines would be almost impossible. Firefighters would also have to contend with the possibility that the initial fire was caused by an incendiary device inside one of the cargo containers, and that other incendiary or explosive devices may be timed to ignite after the first one.

Several solutions to this problem are currently being investigated. One

solution involves a water misting system built into the aircraft itself. This would lower the cabin temperatures sufficiently to allow a more orderly evacuation of passengers and crew, and would help prevent flashover so that firefighters could reach the seat of the fire with handlines.

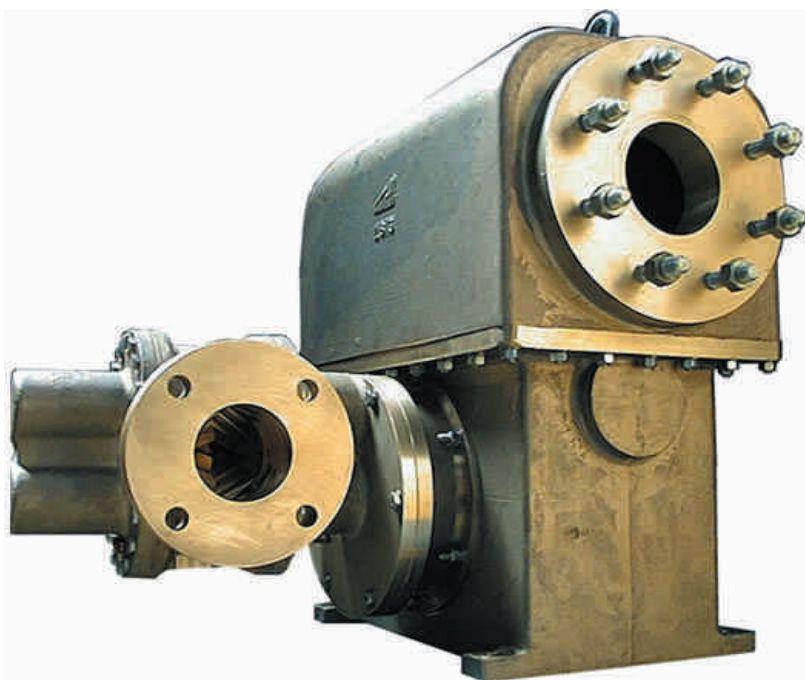
Another solution would be to abandon the tactic of interior attack with handlines entirely and use long-reach, articulating booms with infrared sensors and penetrating nozzles to attack the fire instead. This tactic would allow firefighters to locate the source of the fire more precisely, then penetrate the aircraft skin to apply extinguishing agents inside the cabin. Penetrating nozzles are already used by many airports and they are especially valuable in extinguishing fires inside cargo planes. Currently, some ARFF units are equipped with 15-meter (50-foot) booms. Future units are likely to be equipped with penetrating nozzles on longer 20-meter to 25-meter (65-foot to 80-foot) booms in order to reach through the doors of the upper deck or penetrate the top of the fuselage on the new large aircraft.

The penetrating nozzle design may also change. Many booms drive the penetrating nozzle tip through the aircraft skin by swinging the articulating boom through an arc to develop enough force. In some cases, there isn't enough clearance to get a good swing, and the operator must make two or three tries. In other cases, the penetrating tip hits the skin at an angle and glances off. At least one manufacturer has solved that problem by developing a nozzle head that can swivel both side-to-side and up-and-down to align the tip perpendicular to the aircraft. The operator then releases a spring-loaded mechanism in the nozzle head, which shoves the tip through the skin in one, clean stroke.

### The Results Will be Worth the Efforts

No matter how you look at it, the new generation of large aircraft is going to bring changes to the ARFF vehicles, equipment, and tactics used by airport firefighters around the world. In the end, it will result in new technology that improves firefighter safety and makes aircraft rescue and firefighting even more effective.





## ALBANY PUMPS

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The words "Albany Pumps" are synonymous with various markets and liquids and one prime example is fire fighting and foam.

Albany has been manufacturing pd pumps for over 100 years and their products mirror the company itself – reliable and durable. The pumps achieve high levels of performance for the most demanding applications. The company employs the

latest manufacturing methods, with CNC metal cutting equipment, machining centres and CNC lathes. Strict quality controls are maintained throughout its operation with all pumps tested against specifications on computer based test rigs. Albany is an approved supplier to the Ministry of Defence and complies with API codes for the petrochemical industries. It is an ISO 9001 approved company.

A wide range of types and sizes of gear and screw pumps are available, with many drive and mounting options. Albany's engineering expertise includes a high level of customisation, when required, insuring that pumps can be supplied to meet users exact needs and specifications.

Albany gear pumps are compact, simple, robust and versatile. They have a metering capability and can take some abuse and dry running for short periods. Albany's range covers outputs from 4.5l/m to 1400l/m at pressures up to 21 bars (and higher, if required). For higher outputs up to 3000l/m Albany can supply their twin-screw pumps.

Foam liquid concentrate pumps have to be designed to deal with many types of foam including the corrosive fluoroproteins as well as being flush with water, seawater in many applications. This necessitates construction materials of gunmetal, bronze and stainless steel. Albany gear pumps have internal product lubricated bearings with a self-lubricating facility allowing dry running for short periods and thus meets the NFPA 20 requirement. Shaft sealing is

affected in the low-pressure area of the pump. The choices being gland packing or lip seals for low cost or mechanical seals for the ultimate solution. However, care has to be taken not to let mechanical seals dry out as this leads to seal failure.

Onshore and offshore petrochemical complexes use small portable water turbine driven Albany pumps for flows up to 60l/m. Fixed installations see Albany's range of pumps used with electric motor, diesel engine or water turbine drivers.

The range of compact and robust water driven turbine pump units utilize a Pelton wheel. This design has good power characteristics at start-up and is powered by 8 – 18 bars water. The fixed installation range covers 37 to 1400l/m with foam discharge pressures up to 21bars. One of their major uses on offshore rigs is to provide fire protection on the heli-decks. Other applications include naval and civil marine vessels, fire fighting ships, terminals, refineries, tank farms, storage and supply facilities, and airport hangers etc. On shore; they offer a much lower cost and safer solution to flameproof electric motors or flame-suppressed diesel drives.

Geoff says; "it is only if you do not have water that you cannot fight the fire".

The Albany gear pump is also used in foam tenders and refinery or airport fire vehicles. Pumps can be PTO, hydraulic motor or diesel engine driven to meter foam concentrate into the main water pump output line at 6%, 3% or 1% and up to 21bars pressure. Smaller 40l/m foam pumps are available with 12volt and 24volt DC motors, energized by the vehicle batteries, to re-load fire fighting vehicles with agent from drums. Diesel or petrol engine foam pumps are also supplied in carrying frames for portable use, sometimes mounted in fire engine lockers.

Albany are proud of their products and take a great deal of pleasure in seeing customers, all over the world, more than satisfied with all that the company provides. Albany has been very successful in fire fighting but is not content to sit on their laurels. They are looking to the future with the aim of continuing to be a major force in fire protection with the knowledge that people have peace of mind with every Albany pump installed.

Geoff Maxted, Sales Manager – Albany Pumps

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# AIRPORT CRASH TENDER Z8 ALPAS



# Albert Ziegler GmbH & Co. KG Vehicle Profile



Pic courtesy of Albert Ziegler GmbH & Co. KG

## New Fire-Fighting Vehicles for Stuttgart Airport

- THE STUTTGART AIRPORT FIRE BRIGADE has put into service four new
- crash fire rescue vehicles and one new support fire-fighting vehicle. Two
- vehicles are provided with a telescopic joint extinguishing arm. This report is
- presenting the new vehicle generation and describing simultaneously the
- change in tactics.

### The New Crash Fire Rescue Vehicles

In the projecting, procurement and construction phase lasting almost three years the fleet of vehicles of the Stuttgart Airport Fire Brigade for the field "Aircraft Fire Service" has been modernized and adapted to the ICAO requirements valid from 2005.

As basis for the vehicle conception the specification of "high-performance fire fighting vehicles" of the ADV (Association of German Commercial Airports) has been used which has been developed by the working group "Fire Service". Fundamental demands on essential vehicle components are made like:

- chassis, engine, power transmission
- superstructure
- water/foam extinguishing unit
- powder unit
- fire-fighting equipment
- telescopic joint extinguishing arm (optional) and
- CO<sub>2</sub> unit (optional) instead of powder unit

It was the premise for the procurement that all four new vehicles should be in their essential characteristics of the same design for providing an operation as uniform as possible and naturally training of the firemen, too. Only at the equipment components telescopic joint extinguishing arm respectively con-

ventional foam/water turret concessions have been made to different operations.

After a tender published Europe-wide two bidders have been put on the short list in the end during the bargaining procedure. After the end of these negotiations decision was made for the most economic offer and consequently for Messrs Albert Ziegler GmbH & Co. KG, from Giengen (Brenz), as general contractor and for the crash fire rescue vehicles of the "Z8" series. Here, the crash fire rescue vehicles have been manufactured for the first time completely in ALPAS design (aluminium panelling design). In total the order included four crash fire rescue vehicles with an order volume of around 3,8 millions of Euro. Two vehicles (FLF 60/125-15+270 CO<sub>2</sub>) have been provided with a telescopic joint extinguishing arm and piercing snozzle technology whereas the two other vehicles have been purchased with the customary but nevertheless efficient foam/water turrets (FLF 80/125-15+1000 P).

The delivery of the vehicles has been made after complete clarification of the order in the year 2001 in two stages. Both vehicles with telescopic joint extinguishing arm and piercing snozzle technology have been supplied to Stuttgart Airport Fire Brigade in November 2002. The two crash fire rescue vehicles with conventional turret technology have been supplied to Stuttgart Airport Fire

Brigade in July 2003. In the meantime the all four vehicles are in use and the old vehicle generation has been replaced completely. Thus, the Stuttgart Airport Fire Brigade has one of the most modern vehicle fleets for aircraft fire fighting Europe-wide since the second half of the year 2003.

### Telescopic joint extinguishing arm

Exceptional feature of both vehicles FLF 60/125-15+270 CO<sub>2</sub> supplied at first is a telescopic joint extinguishing arm on the point of which a swivel-type foam/water turret is mounted. With it an optimum positioning at the object of the turret can be achieved especially due to the fact that in connection with the telescopic joint extinguishing arm the output of the extinguishing agent can be made directly on the fire object (e.g. at an aeroplane) thanks to a vertical turret position. The use of the turret is possible under-floor and also the positioning of the telescopic joint extinguishing arm near to the ground at simultaneous turret position for output of extinguishing agent upward.

Consequently, thanks to the multifunctional use of the telescopic joint extinguishing arm always the most favourable extinguishing position can be achieved.

### Piercing device

The piercing device has been developed due to previous experience in the USA. During the years of 1995 and 1996 many real tests have been made by the Federal Aviation Administration (FAA) with such a positive result that on all larger commercial airports in the United States of America vehicles with joint extinguishing



*At the point of the telescopic joint extinguishing arm a multi-gallonge nozzle and the piercing device are installed.*

arm and piercing device have become compulsory. At both FLF of the Stuttgart Airport Fire Brigade the foam/water turret installed on the head of the telescopic joint extinguishing arm can swivel away laterally. For this reason the piercing device mounted at the point of the telescopic joint extinguishing arm is always ready for operation, too.

By the piercing device also called "extinguishing lance" the shell of an aeroplane can be pushed through at suitable spots (e.g. on top of the cab windows, equipment locker). In the area of the point of the piercing unit many small openings are provided laterally. Thanks to these openings water can be delivered fine dispersed in the inside of the cab at a cab fire. The supply of this extinguishing unit is made through the extinguishing agent tank of the crash fire rescue vehicle. The supply is provided via a piping system mounted in the telescopic joint extinguishing arm.

By this new conception of the fleet for the aeroplane fire fighting the procurement of separate vehicles with so-called "additional extinguishing agents" e.g. BC powder has been abandoned.

Just two of the four procured crash fire rescue vehicles have been equipped with additional extinguishing agents by a modular system on changing frame basis respectively changing container basis. Thus, the two "Z8" with telescopic joint extinguishing arm and piercing snozzle technology (FLF 60/125-

15+270 CO<sub>2</sub>) are provided with 270 kg carbon dioxide (CO<sub>2</sub>) as additional extinguishing agent and the two FLF with conventional turret technology (FLF 80/125-15+1000 P) have a 1000 kg powder unit with BC powder.

During the first intervention powder will not be used anymore as "main extinguishing agent" in future, i.e. extinguishing powder will no longer be used primarily at aeroplane fire fighting.

It just will be thrown through the bumper turret at the corresponding crash fire rescue vehicles in combination with the multiple gallonge nozzle (foam/water mixture) on the burning object.

The attack positions of the FLF have been changed that two vehicles (FLF 80/125-15+1000 P) are located in the central area. The vehicles with telescopic joint extinguishing arm and piercing snozzle technology (FLF 60/125-15+270 CO<sub>2</sub>) are positioned that they always can be put in action along the fuselage respectively in the area of the landing gear/power unit as required.

This means that the vehicles are positioned in a distance of about one to one and a half vehicle length around the aeroplane. For the future, pure powder attacks just will be made in very few cases (e.g. three-dimensional dropping fires in the area of the power unit), mainly by use of manual branchpipes.

The throw of the telescopic joint extinguishing arm (FLF 60) is approx. 75 m. Furthermore the joint extinguishing arm can be positioned for action maximum 10 m respect. 7.5 m in front of the vehicle (telescoping) thus enabling the FLF 60 acting more effective in the area of the power units and the landing gears. Both vehicles with conventional extinguishing technology can throw their extinguishing jet up to 80 m.

### Final observation

By the complete modernization of the fleet of fire fighting vehicles for aircraft

fire protection the Flughafen Stuttgart GmbH has realized for their airport fire brigade an investment both innovative and forward-looking securing the efficiency, also with regard to the forthcoming alterations of the ICAO Recommendations, over the year 2005 without having to make larger retrofitting in this field (according to actual stage of technology). Especially the reduction of the fleet on four compact vehicles will bring some potentials of economy regarding business management to Stuttgart Airport. Just also when considering maintenance of the fleet as the vehicle technology used since then partially has showed after all again and again small susceptibilities related to a particular age and vehicle with non-insignificant subsequent costs.

The decision to provide two vehicles with telescopic joint extinguishing arm and piercing snozzle technology means on one hand that by this technology new ground has been broken in Germany. On the other hand, however, it can be expected for the foreseeable future that these extinguishing and rescue appliances also will become compulsory equipment of the airport fire brigades in Germany and then they have to be used at any German commercial airport.

For this reason it will be ensured that the additional costs for the actual procurement of the telescopic joint extinguishing arm and the piercing snozzle technology will pay for themselves looking at the years. Especially, when considering that retrofitting will cause a considerable higher need of funds or even result in the request for a new procurement of vehicles if it will be found out that a modification cannot be realized at the already existing chassis for technical reasons.

Also by the procurement of the HTLF 24/50-5 a necessary replacement has been made and realized by the vehicle being put into service now. The request made to the bodybuilder for storage of as many extinguishing agent and equipment as possible on the chassis has been realized brilliantly by Messrs Ziegler.



*Superstructure of the new HTLF 24/50-5 has been made by Ziegler*

Thanks to a thought-out superstructure and equipment management in close co-operation with the technical engineering department of the Stuttgart Airport Fire Brigade without any question a real wonder of space has been designed also completing the fleet for building fire protection/technical support and meeting the demands on Stuttgart Airport Fire Brigade as approved works fire brigade.



# Large Diameter Hose and Large Volume Delivery Devices

By Chauncey Naylor

*Pic courtesy of Williams Fire & Hazard Control, Inc.*

THE TITLE “BIG GUN” is not a new term in the industrial fire fighting business, however 20 years ago a 2,000 gallon per minute monitor nozzle was considered to be extremely large. Today we see upwards of 15,000 gallons per minute from a single nozzle.

The driving force behind big gun technology is the massive size of the exposures protected and the limited success of the industry as a whole, to extinguish them. The diameter of the average storage tank in the oil industry today is 200 feet. The upper end of the spectrum reaches over 345 feet in diameter and the current trend is to replace existing smaller tanks with bigger ones.

A common problem experienced in the past was the inability to successfully deliver finished foam over the top (NFPA Type III) of a storage tank and onto the surface of a burning liquid. One of the reasons may have been the use of air-aspirated nozzles generating foam to light to make the trip. Another reason was the extreme radiant heat caused the responders to set up equipment to far from the tank exceeding the effective range of the nozzle(s). If the aforemen-

tioned was somehow overcome, the reality of the foams ability to run and cover the liquid surface became an issue.

NFPA 11 states “foam may run approximately 100 feet across the surface of a burning liquid”. It is important to know this due to the fact that extinguishment can only be achieved when the entire exposed surface has been covered completely. Once this mind set has been established you can go about the work of a “successful

extinguishment” (definition: when the cost of the extinguishment does not exceed the value of the product saved). This obviously rules out the “controlled burn-out”. We know if the person “in charge” makes the statement “the best thing to do with this fire is to let it burn out”. What they really mean is we have tried everything and have run out of foam and ideas and we just can’t put it out.

The industry for years has known when handling a fully involved “Jumbo” Storage Tank fire (tanks in excess of 200 feet in diameter) most all activities can and should be pre-planned. The only variables you must count on changing are the environmental conditions at the time and the personnel available to respond. The rest is at the mercy of “Murphy’s Law” (for those who don’t know: M’s Law – “*what can go wrong probably will go wrong*”). Contingencies are paramount

# Large Diameter Hose and Large Volume Delivery Devices



when considering extreme hazard incident planning. In some cases the most difficult and costly component needed to complete a large volume firefighting effort is water. We will assume (this is a prime target for M's Law) that firefighting water is available in sufficient quantity to handle each scenario.

When dealing with large scale full-surface fires there are basic calculations needed to determine the required flow. The square foot of the exposed surface is calculated and the recommended

application rate is applied, the sum of which is the required flow. NFPA (minimum standard) recommends: 16/ft<sup>2</sup> foam concentrate. It has recently been proven that higher application rates may apply to tanks in excess of 150'. These elevated rates are determined through experience and basic science. A simple way to explain this is to consider the landing zone area of the finished foam when it lands on the surface of the product contained in the storage tank. We call this landing zone a Foot-

Print™. Every nozzle has an elliptical shaped landing zone area characteristic of its volume, reach and quality of fire stream (consult the manufacturer of your nozzle to quickly determine its specifications). The simplest way to determine if a flow is sufficient, is to diagram a tank with a landing zone inset to scale.

## EXAMPLE: 1:1

**Note:** For orientation purposes use a "clock face" layout.

With the FootPrint™ centered in the tank calculate the foam run requirement or distance to the inner tank shell on at each of the four clock positions.

Using the recommended application rate determine if the foam run is acceptable. The optimum foam run is anything less than 80' on crude oil and 100' on most all hydrocarbons.

It is evident large volume single or massed streams are important and necessary for a successful attack on a jumbo tank full surface fire. Large scale foam fire fighting definitely takes a proven package. The foundation of the package is a good plan that begins with an adequate water supply. The best equipment, foam chemical and pre-plan in the world will not get it done without the water. It's been said: "If you can't supply the water . . . you'd better have good insurance!"

With the basics out of the way the next step is to deploy and set up the required equipment. In this business, when a training scenario is planned it is often based on a "worst case" event. For example: The largest tank, the most distant water supply, the least amount of people, the worst wind condition and so on.

*The square foot of the exposed surface is calculated and the recommended application rate is applied, the sum of which is the required flow.*

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When engaging these events both in training and in the real world we must strive for an unfair advantage. This unfair advantage is approached from many angles. For example today we can take advantage of the best available equipment, foam chemicals, proportioning and delivery devices in the history of the fire service. Equally important is the experience of those in the business that have enjoyed success in dealing with major fires. It's all out there and more accessible today than ever.

The weak link in the equation is too many times we are forced to settle for low bid specs in many aspects of fire protection. Where and when do we make a stand? We make a stand when it comes to life safety (firefighter safety) and we do it now! Fighting a fire is not always a "safe" task. The risk is high when it comes to dealing with the extreme. Risk is something we accept in this business of emergency response, but it must be evaluated by a person or people with experience and qualified to do so.

Although hard to imagine, there will be a time(s) in one's career where the decision must be made to let it go and protect the exposures. Often times this decision is not dictated by the qualifications of the person in charge or their staff, but by the resources available to



Pic courtesy of Williams Fire & Hazard Control, Inc.

them. This is not a failure in anybody's book. In this case the recognition of a no win situation early on and the decision to take a defensive stand can prove to be a wise one and can potentially save lives and nearly as important precious resources. There have been many gallons of foam chemical shot at fires when the application rate was so deficient there was no chance for extinguishment. Even a premium foam concentrate cannot overcome this scenario. The difference may be only a few hundred gallons, but if the mark is missed failure is certain.

The first disadvantage many face is lack of experience regarding large flammable liquid fires. This is due to the frequency or better said the infrequency of the "major fire" in one's career. Many large storage tank fires that occur are the first that particular facility or community has ever experienced. If the depth of real world experience is weak, the training and preparation has been minimal, combined with low bid equipment and foam, what can we expect the results to be? This is a serious business that has a lot of down time. History reminds us we don't always make the best of idle time, which can make it hard to justify the purchase of leading edge equipment. When budgeting for new hardware, foam and equipment sometimes we hear "when was the last time we had a tank fire?" or "What are the odds?", "Do we really need the best if it will "never" get used?" The truth is major fires do happen and those who chose this profession are charged with the responsibility to be prepared to handle them.

*There have been many gallons of foam chemical shot at fires when the application rate was so deficient there was no chance for extinguishment.*

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# Large Diameter Hose and Large Volume Delivery Devices

Large volume equipment and large diameter hose has change dramatically over the last 20 years. Today the industry has the choice of a wide range of supply hose from 2.5" to 12". For the jumbo storage tank plan on leaving the 2.5" on the truck!

For example a 200' diameter gasoline storage tank requires a minimum of 6,000 gallons per minute. If we set up a 6,000 gallon per minute monitor nozzle and supply it with 5" hose we would need a minimum of 6 lines, possibly more depending on the length of lay. The manpower and time and effort it takes to layout that much hose is considerable. The dilemma is if we choose 6" hose we really haven't really saved much. Considering the "rule-of-thumb" for LDH is as follows (once again depending on length of lay and elevation):

5" = 1,000 gallons per minute  
6" = 1,450 gallons per minute  
8" = 3,200 gallons per minute  
10" = 5,300 gallons per minute  
12" = 8,000 gallons per minute

It would take 5 lays of 6" hose to insure delivery of our required 6,000 gallons per minute. That is a single lay savings. It's something but really doesn't justify changing out 5" hose for 6". Now your probably thinking it's an easy choice to go to 8", but think about it. The cost of the couplings and adapters alone nearly make the deal cost prohibitive. When you add the less than acceptable 150p.s.i. working-pressure it starts making less sense. The accepted standard working pressure for LDH was 150p.s.i. to 200p.s.i. That proved to be OK until we realized we are routinely working with pressures in excess of most of the available LDH service pressures when supplied with plant fire water systems. Therefore we were operating on the unacceptable ragged edge of safety. Conditions like this one are exactly what drives new technology in this business.

Now consider the everyday scenario of having 8" hose for your basic supply line and you can see it is not practical for the overwhelming majority of fire

departments. Although there are 3,500 gallon per minute Industrial Pumpers out there the average is still between 1,500 and 2,000 gallons per minute. So even a single 8" lay on the 2,000 is 1,200 gallons more than the apparatus can make use of.

By now your hopefully looking for a "make sense" answer as we were. We simply designed what we wanted and asked our hose supplier to make it. Sounds simple? It was! What we wanted was a hose capable of reducing the number of lays required by half, therefore reducing the manpower, time and effort by half. The basic calculations told us we needed a 7.125" diameter hose. The next decision was the coupling. 5" Storz was obviously too small and we knew that a specialty sized coupling would be too costly! So we settled on working with the existing and affordable 6" Storz. The fact was we had to accept a certain amount of restriction from the hose diameter to the coupling diameter. With just a little more engineering we discovered the answer was to increase the hose size to 7.25" to overcome the restriction of the coupling. Couple that with a super lightweight jacket, a working pressure of 300p.s.i. and a friction loss factor of less than 3p.s.i. per 100' and you could say we hit a home run! The new "Double 5 Brand" hose as it is now called flows (at nominal pressures) 2,000 gallons per minute. That's exactly what this industry needs for a practical LDH, one hose that replaces two effectively. With the service pressure at three hundred you can bet we tried to blow the coupling off of it. When we got the pressure up to 180p.s.i. we realized we were flowing in excess of 3,300 gallons per minute through one hose. We were more than satisfied at that point.

Now that we have figured out the best way to deliver large volume water to the fire scene, let's see how we can effectively deliver it to the fire's surface. As mentioned in the beginning of this story a 2,000 gallon per minute monitor was thought of as very large. In fact at the time 2,000 GPM was thought to be as big as we'd need to go.

The advent of new concepts and methodology soon proved the need for bigger was real. The old surround and

*The advent of new concepts and methodology soon proved the need for bigger was real. The old surround and drown method wasn't working.*



*The first thing was to mass the streams, bring them together to increase the impact density allowing the foam to survive long enough to get a start on controlling the fire.*

drown method wasn't working. The application density wasn't being met by spreading the nozzles out around the perimeter. The impact density wasn't allowing the foam to get a bite on the fire. As just as important the foam wasn't making the trip across the burning liquid surface enabling a complete coverage foam blanket.

The first thing was to mass the streams, bring them together to increase the impact density allowing the foam to survive long enough to get a start on controlling the fire. This concept leads to our patented FootPrint™ methodology. The massed stream idea

was very effective on storage tanks up to 150 feet. The inevitable question was asked; "what about the jumbo sized tanks?"

The task was to get complete coverage on the tank's surface. The trick was to make it happen. The truth was it would have been impossible to extinguish a jumbo tank with the nozzle technology at the time. The answer was bigger is better, but it went beyond that. We need a delivery devise that would not just flow the required flow but would shape the water/foam into an effective stream with ranges to compliment the FootPrint technology.

The results were staggering. Today we have nozzles that flow up to 15,000 gallons per minute and reach out over 500 feet! Most of our "Big Gun" technology has been engineered into a hybrid design. We have automatic nozzles with flow ranges from 1,000 to 3,000 gallons per minute, 1,000 to 6,000 gallons per minute, 2,000 to 10,000 gallons per minute and finally our "BigFoot" adjustable flow nozzle with a range from 2,000 to 15,000 gallons per minute. All of these nozzles are descendants of our original Hydro-Foam Self Educting technology. All of these nozzles are foam systems. The concentrate is delivered directly to the nozzle either by self-educting or jet ration controller pump. This feature allows the foam concentrate to be staged at a greater distance from the "hot zone" work area providing the majority of responders involved the best protection available: distance from the fire!



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# TITAN® HPR 8X8 12,150 L (3,210 gallon) ARFF Vehicle Specifications

**Frame:** 551,724KPA (80,000 PSI) yield strength low carbon tubular steel rails 305 mm x 101 mm x 9.5 mm (12" x 4" x 3/8").

**Bumper:** Tubular type front and rear bumpers finished in matte black.

**Fuel System:** 348 L (92-gallon) welded steel fuel tank with dual Racor fuel/water separators, mechanical fuel pump.

**Front Axles & Suspension:** 11,793 kg (26,000 lb.) per axle capacity planetary type, front drive and steering assembly, independent suspension with 400mm (15.7") wheel end travel, dual variable rate helical springs and co-axial telescopic damper assembly, rubber bump stops, power steering and 508mm (20") diameter two spoke padded steering wheel.

**Rear Axles & Suspension:** 11,793 kg (26,000 lb.) per axle capacity planetary type rear drive assembly, independent suspension with 400 mm (15.7") wheel end travel, dual variable rate coil springs and co-axial telescopic damper assembly, rubber bump stops.

**Differentials:** Driver controlled locking type in each axle with indicator light showing positive engagement.

**Brakes:** Full air, inboard air ventilated, Anti-lock disc brake system (ABS), located between the frame rails on each axle shaft with 453 lpm (16 CFM) compressor, heated desiccant air dryer, drain valves at each tank, and spring actuated parking and emergency brake on rear axle.

**Tire & Wheels:** Eight (8) Michelin® 24R21 wide base, radial ply tires mounted on 533 mm x 457 mm (21" x 18") steel disc wheels. Optional spare tire and wheel shipped loose with vehicle.

**Engine:** Rear mounted 4-cycle Detroit Diesel® MTU engine, series 12V2000 rated at 749 kW (1,005 BHP) @ 2,100 RPM with muffler, vertical exhaust stack. Heavy duty radiator with fan and shroud, 50/50 ethylene glycol mixture and sight level gauge. A block heater with thermostat is optional.

**Transmission:** Allison M-6610A electronic six speed automatic transmission with torque converter, oil to air cooling system and hydraulic filter. Electronic selector in cab lighted for night operation.

**Power Divider:** Cushman Model 385 power divider with modulating wet clutch between engine flywheel and transmission activated by a cab switch. Modulation accomplished by accelerator pedal after engagement. Pump drive actuated by cab switch controlling hydraulic engagement of multiple discs wet clutch. Manual override for pump clutch.

**Transfer Case:** Full time all wheel drive. 30/70 Biasing differential.



**Cab:** Two doors, one piece GRP (Glassfibre Reinforced Polyester), tinted windshield, electric tinted door windows, non-slip pattern rubber floor mat. Cab mounted independent of body and chassis using insulated rubber cushioned mounts. Cab equipment includes high capacity 69,000 BTU heater/defroster, self canceling turn signals, parking brake control, all wheel drive control, three (3) wet arm two-speed electric windshield wipers with delay feature and one 3.7 L (1 gallon) washer, test panel for warning systems.

**Seating:** Drivers seat is a mechanical adjustable SCBA type located left of center. Passenger seats are mechanical adjustable SCBA type located right and rear of center.

**Mirrors:** Two (2) power operated and heated outside rear view mirrors. Mirrors are rectangular with separate convex unit, attached to doors.

**Electrical Systems:** The apparatus shall have an on-vehicle networking system (E-Logic®), also known as multiplexing, which will provide real time or current state diagnostic capability and reduce troubleshooting or down time when compared to a standard point to point wiring scheme.

**Cab controls shall include:** master electrical switch, starter button, shutdown switch, dash lights with rheostat and compartment light switch.

**Instrumentation includes:** electronic tachometer with hour meter, electronic speedometer with odometer, front and rear air gauges with warning lights and alarm, oil pressure and water temperature gauges with warning lights and alarm, voltmeter, fuel gauge, transmission temperature gauge, high beam indicator, self-canceling turn signal, hazard switch, water and foam tank level lights.

**Equipment includes:** engine start and stop controls, directional lights, cab heater, lighted rocker type switches marked and back lighted, and fire system switches – guarded toggle

type. Wiring per SAE J-1128 with color coding and function imprint every 76mm (3"). Headlights single faced, amber turn signals. Clearance and rear stop/tail/turn and back up lights.

**Alternator:** A 24V 220 amp SAE (J56) rated alternator.

**Batteries:** Four (4) Group 31, 950 CCA, 12-volt batteries, single 24-volt system mounted in a ventilated area, accessible for maintenance. On-board charger with shore line connection.

**Body:** GRP (Glassfibre Reinforced Polyester) sandwich construction with an integrated water and foam tank.

Separate rear body section mounted to chassis with sliding hood for engine access. Slip resistant walkway on top of tank to fill hatches. Rear step access to top from ground. Removable panels and/or doors provided for access. Roll-up shutter style locking compartment doors.

**Equipment Compartments:** Large enclosed equipment compartments are supplied for reels, hose lines, and ancillary fire fighting equipment.

**Water Tank:** 12,150 L (3,210 gallon) capacity, integrated into the maintenance free GRP body. A 500 mm (20") fill opening and quick opening manhole cover is located on top of the tank.

**Foam Tank:** 750 L (198 gallon) capacity, integrated into the maintenance free GRP body. Manhole tank access available for water and foam tanks.

**Pump:** Single stage centrifugal (PTO driven) pump with bronze impeller and wear rings, self-adjusting mechanical seal and corrosion resistant cast housing with a capacity to supply all crash mode outlets simultaneously. 7,950 lpm @ 13.8 bar (2,100 gpm @ 200 psi).

**Plumbing:** Stainless steel and flexible high pressure hose plumbing throughout with



# Vehicle Profile



clamp and seal type removable connections.

Left side: One (1) 64mm (2½") gated female water tank fill/drain with plug and one (1) 38 mm (1½") gated male foam fill/drain connection with cap. Two (2) 64 mm (2½") discharge lines.

## Performance Parameters for TITAN® HPR 8X8 European Style

**Water Capacity:** 12,150 Liters (3,210 Gallons)

**Foam Capacity:** 750 Liters (198 Gallons)

**Estimated Dry Shipping Weight:** 27,215 kgs (60,000 lbs)

**Estimated in service weight:** 41,276 kgs (91,000 lbs)

**Gross Vehicle Weight Rating:**

*Front:* 23,586 kgs (52,000 lbs)

*Rear:* 23,586 kgs (52,000 lbs)

**Engine:**

*Make:* Detroit Diesel® MTU Series 2000

*Model:* 12V-2000, 750 kW (1,005 BHP) @ 2100 rpm

*Size:* 23.89 L (1,458 cubic inch)

*Bore:* 130 mm (5.12")

*Stroke:* 150 mm (5.91")

*Torque:* 4,203 N-m (3,100 lb-ft) @ 1,350 rpm

**Transmission/Transfer Case:**

*Make:* Allison

*Model:* M-6610A

**Gear Ratio:**

4.00:1 – first

2.68:1 – second

2.01:1 – third

1.35:1 – fourth

1.00:1 – fifth

0.67:1 – sixth

3.456:1 – reverse

**Differential:** 30/70 biasing differential

**Torque Converter:** Allison

**Power Divider:** Cushman 385 w/PTO

**Style:** Hydraulic, multiple disc wet clutch

**Ratio to Pump:** 0.6: 1.0

**Approach Angle:** 30 degrees

**Departure Angle:** 30 degrees

**Interaxle Clearance Angle:** 12 degrees

**Underbody Clearance:** 460 mm (18")

**Underaxle Clearance:** 330 mm (13")

**Turning Diameter:**

*Wall to Wall:* ≤ 36 m (117 ft)

**Chassis Flexibility:** Climb a vertical wall 460 mm (18") high and negotiate terrain which will deflect the opposite wheels of the truck in alternating contrary directions at least 356 mm (14") without the remaining wheels losing traction.

**Acceleration:** 0-80 kph (0-50 mph): within 35 seconds

**Top Speed:** 125 kph (78 mph) maintained for at least 32 km (20 miles)

105 kph (65 mph) for 97 km (60 miles)

**Gradeability:** 20% @ 13 kph (8 mph) ascend and maintain speed.

40% @ 1.6 kph (1 mph) ascend, stop, start, descend, stop, start while extinguishing agents from the primary turret

50% @ 1.6 kph (1 mph) ascend and descend

**Side Slope Stability:**

*Static:* Minimum of 30 degrees (58%)

*Dynamic:* Minimum of 12 degrees (20%) while extinguishing agents

**Dynamic Balance:**

On 100-ft (30m) radius: 35.4 kph (22 mph)

**Brake Holding:** Parking 20% ascending and descending

Service 50% ascending and descending

**Brake Stopping Distance:**

*Service:* 32.2 kph (20 mph): 12.2 m (40 ft)

64.4 kph (40 mph): 48.8 m (160 ft)

*Emergency:* 64.4 kph (40 mph): 87.8 m (288 ft)

**Pump Flow Rate:** 7,950 lpm @ 13.8 bar (2,100 gpm @ 200 psi)

**Roof Turret Discharge:**

*Flow Rate:* 1,419/2,839 lpm (375/750 gpm)

@ 13.1 bar (190 psi) nonaspirated

**Control:** Electric Joystick

*Reach Straight Stream:* 76 m (250 ft)

*Reach Dispersed Stream:* 23 m (75 ft)

*Width Dispersed Stream:* 10.5 m (35 ft)

*Horizontal Rotation:* 240 degrees (Akron)

*Vertical Travel:* 45 degrees above to 20 degrees below horizontal

**Foam Proportioning System:** Automatic around the pump type foam proportioning with individual metering port for each foam outlet.

**Lighting & Warning Equipment:** Electronic siren with PA system and output speaker at cab front.

Two (2) integrated warning beacons front and rear.

Two- (2) 24-volt deck lights with master control in cab.

One (1) 24 volt light in each enclosed compartment, two (2) 24-volt lights in the engine compartment and two- (2) 24-volt lights in the body service areas.

Back up alarm

**Finish:** Cab interior in gray color

Chassis painted black

Exterior finish acrylic urethane high gloss enamel in user choice of single non-metallic color: lime, red, white, or yellow.

Up to sixty (60) 76 mm-203 mm (3"-8") reflective film letters and three numerals for vehicle identification.

**Testing, Delivery, Training & Technical Documentation:** The complete unit is function tested to FAA 150-5220-10C "Production Test" requirements.

**Manufacturing point:** The Netherlands

*Estimated weight of completed unit:* 27,215 kgs (60,000 lbs)

*Estimated in service weight:* 41,276 kgs (91,000 lbs)

*Estimated volume of completed unit:* 126 cubic meters (4,458 cubic feet)

*Dimensions:* 3,700 mm x 3000 mm x 12000 mm (145.7" high x 118" wide x 473" long)

Two each parts, service and operations manuals on CD-ROM

Five days operator training and instruction at destination by E-One technician

## Note:

These specifications reflect design standards at time of publication and are subject to change without notice.

## Emergency One, Inc.

P.O. Box 2710 Ocala,  
Florida USA 34478

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[www.e-one.com](http://www.e-one.com)

Subsidiary of Federal Signal Corp  
November 2002

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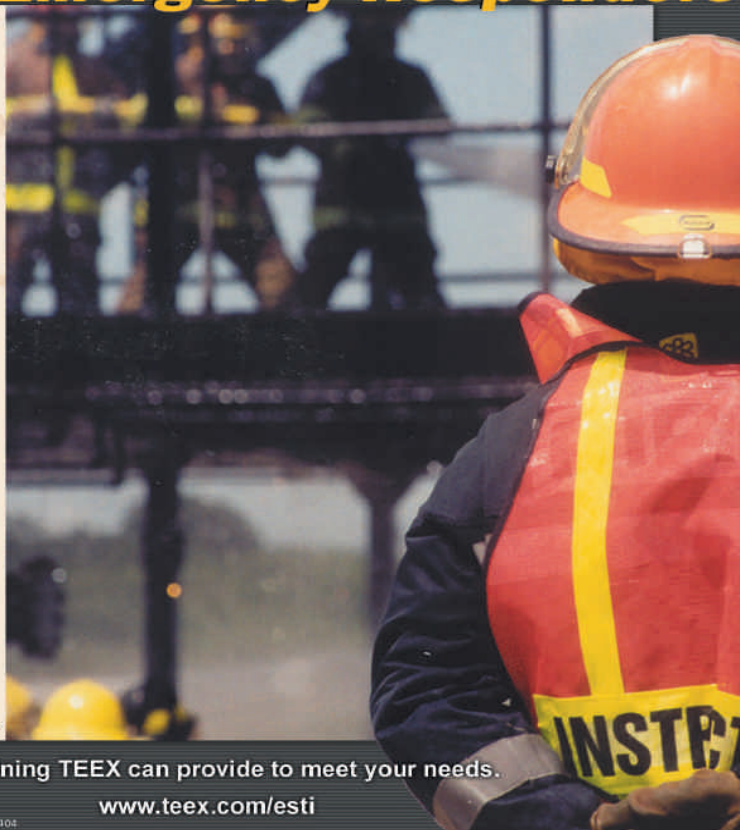
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# Fire and Rescue Training





# Emergency Service

## Training Firefighters in the United



mation and hands-on experience to better handle the ever-changing dangers facing fire and rescue personnel. All ESTI instructors are certified and have extensive experience in their subject areas. Courses consist of quality interactive lectures and demonstrations conducted first in a classroom setting and later practiced during extensive hands-on training exercises using realistic full-scale training props and scenarios on the Brayton Fire Training Field's array of rescue, disaster, and hazardous materials training stations, in addition to the 22 fueled, live-fire props that, in total, make Brayton one of the largest and most comprehensive training facilities in the world.

ESTI offers more than 130 courses to clients around the world; many of those courses are tailored for each delivery to address individual client needs and requirements. Courses meet or exceed the highest national standards – including NPQS, NFPA, DoD, US Coast Guard, EPA and OSHA – and are provided

IN 1931, THE TEXAS STATE LEGISLATURE instructed Texas A&M University to create and operate a Fire Training School to train career and volunteer firefighters for the state. A training program was already in place at A&M, started the previous year by the State Firemen's and Fire Marshals' Association of Texas and attended in its first session by almost 200 firefighters from around the state. After that first session the legislature recognized the need for a permanent school and established the Fire Training School as the official fire training agency for the state.

What started out as a small but vital fire training program has evolved into the Emergency Services Training Institute (ESTI), training more than 50,000 emergency response personnel from all 50 United States and more than 40 countries each year. From its original focus on fire response and mitigation, ESTI has evolved to incorporate all manner of emergency response training, from rescue to emergency medical to hazardous materials. ESTI conducts its state-of-the-art training at the Brayton Fire Training Field in College Station, Texas, the Center for Marine Training and Safety (CMTS) in Galveston, Texas, at regional training sites located around the country, and at client locations worldwide. ESTI is one of several divisions of the Texas Engineering Extension

Service (TEEX) that, combined, train more than 120,000 people each year in emergency and public works vocations. TEEX is a Member of The Texas A&M University System.

The Brayton Fire Training Field is one of the largest live-fueled, firefighter training facilities in the world. The 120-acre site is home to 132 "props" or specific training stations, including 22 fueled, live-fire props.

### TRAINING PROGRAMS AND COURSES

ESTI's training programs and courses are constantly revised and updated to incorporate the latest legal, technological, and procedural standards and innovations. Emergency responders taking ESTI courses are kept abreast of the new opportunities and developments in their fields and gain valuable classroom infor-





# Fire Training Institute

## States and Worldwide for 75 years

through a variety of training programs as discussed below:

A Bachelor's Degree Program in Emergency Management Administration is available online.

### ■ Industrial (Private Sector) Firefighting

The Industrial Firefighting Program offers courses that provide personnel from around the world with strategies, tactics, and skills needed to safely prevent and control emergencies at plants where flammable substances could endanger lives, facilities and surrounding communities. Courses offered include exterior and interior fire brigade, incident command, bulk storage emergency management, firefighting for coal utilities, emergency operations center and incident safety officer.

### ■ Rescue

The Rescue Training Program offers industrial and municipal rescue courses designed to prepare rescuers to safely, efficiently, and effectively perform



emergency rescues. The program offers a comprehensive collection of industrial and municipal rescue training, including confined space, vertical/high angle, advanced rope, water, passenger train, and structural collapse rescue.

### ■ Hazardous Materials

The Hazardous Materials Program offers training at the awareness, operations, and technician level. Courses are also offered in incident command, tank truck emergencies, chlorine emergencies, and air monitoring.

### ■ Municipal

Each year, ESTI's Municipal Program provides training to thousands of career and volunteer personnel with extensive hands-on training in basic and advanced level fire protection, fire suppression, investigation, emergency management, hazardous material control and rescue techniques.

### ■ Annual Schools

Between three and four thousand fire service personnel from municipalities and industries around the world participate in intensive week-long training courses that make up the annual spring school and the annual summer

schools. One of the summer schools is conducted entirely in Spanish to meet the needs of Spanish speaking students. Courses range from basic to advanced levels and are taught by hundreds of instructors, each experienced in specific areas of emergency response.

### ■ Marine

The Marine Program in College Station, Texas, along with the Center for Marine Training and Safety (CMTS) in Galveston, Texas offer a full spectrum of marine firefighting, rescue, safety, and prevention courses, as well as land-based marine firefighting and a full suite of oil/hazardous substance spill training courses.

### ■ Aircraft Rescue Firefighting (ARFF)

The ARFF Program has been training firefighters for over 30 years and offers a wide variety of courses. The ARFF Program is committed to providing the highest quality training to airport firefighters and firefighters in jurisdictions serving airports. Courses include the 120 Hour ARFF Academy, 40 Hour Aircraft Firefighting Operations, Driver/Operator and FAR Part 139 Compliance Drills.





### ■ Recruit

The Recruit Fire Training Academy is committed to developing the premiere candidate for the fire service through intense 540 hours of classroom and physical training as well as state-of-the-art hands-on application. The Academy exceeds all requirements set by the Texas Commission on Fire Protection and NFA Standards.

### ■ EMS

The EMS Program offers a variety of courses including attendant, technician, paramedic, basic trauma life support, extrication, vehicle operation, and dispatch training. Basic and advanced patient simulation courses take advantage of a dynamic, interactive Human Patient Simulator.

### PROPS

ESTI's training props range from full-scale buildings to chemical plant structures, from aircraft to ships and trains, and include Disaster City, an urban infrastructure simulation complete with a shopping center, home, public assembly, and other buildings designed to simulate various states of collapse caused by a natural disaster or terrorist activity. Some of the props are described in detail below.

### ■ Chemical Complex

This multi-level structure simulates a chemical operations fire in order to train the techniques and coordination necessary when using more than one type of extinguishing agent simultaneously on multi-level chemical structure fires. Multiple hose lines are required, using water and foam for fire control, fuel valve isolation, and personnel protection. Dry chemical extinguishers can be used in combination to extinguish isolated fires within the structure.

### ■ Process Unit

This prop is designed to create the same effects that may occur in an actual process unit fire in a refinery or chemical plant. The evolution involves the burning of diesel, gasoline, and propane to create an intense ground fire, a simulated line rupture, and fires in and around process pumps and equipment. Students experience first-hand personal protection provided by the full fog nozzle pattern. Two hose lines approach the fire and close valves which control the flow of propane after it is released to simulate a pipeline rupture. In order to provide as much training and experience as possible, six 1½-inch assault lines and two 2½-inch safety lines are used.

### ■ Pipe Rack

The pipe rack includes a flammable liquid containment of diesel and gasoline and an elevated walking platform to simulate the typical refinery, chemical process unit, or loading rack/terminal operation. The pipe rack is conveniently situated between related API projects, to resemble the obstacles typically encountered in real situations, adding to the complexity of any training exercise.

### ■ Pump Alley

This project involves sets of double pumps that represent seal and flange leaks. A meter loop, simulated compressed air cylinder, and chain-operated valves to operate overhead/elevated flange leaks add to the complexity of this project. Students learn the importance of multiple hoseline coordination and teamwork, and water pattern techniques are an integral part of this training.

### ■ Aerial Cooler

Fueled by a combination of both petroleum gas and gasoline, the Aerial Cooler is the world's largest burn prop. Replicating the structure and equipment found in process units of both the refining and chemical industries, this project includes sets of double pumps simulating various leaks, overhead flange leaks, small aerial cooler tube ruptures, large aerial cooler flange failure, grating-covered drainage trough, and various vessels. Teams utilize both water and dry chemicals on both ground and elevated levels.

### ■ Loading Terminal

This project consists of an in-depth spill covering approximately 2,400 square feet, within a loading facility area consisting of multiple elevated storage vessels and pumps with numerous flange and overfill scenarios. The training provides students with a basic understanding of the concepts, hardware and functions necessary to control and extinguish a loading terminal emergency.

### ■ Rail Car Loading Rack

The tank car project is designed to simulate situations that could occur while loading or unloading general-purpose rail cars. Fire and spill problems include open dome fires, overfills, line leaks, or separations.





## ■ Tank & Dike

Flammable liquid process tank fires challenge students, and spill fires add to the complexity by surrounding the two smaller of three tanks. The project is made up of one 30-foot open tank and two 12-foot open top tanks with dike fires and several critical exposures. Project orientation includes foam types, foam applications techniques, compatibility of foams, education equipment, foam nozzles, and adjustable fog nozzles.

## ■ Hazardous Materials

The training facility features a variety of tank trucks in the upright and in accident simulation, as well as rail tank cars to recreate hazardous material incidents in the rail industry. Real structures used to contain hazardous materials can be activated to leak liquids and gas. Confined space entry mockups and several simulated waste sites are also available for hands-on training. Students get first-hand experience using the appropriate tools and techniques. A wide array of personal protective equipment, monitoring equipment and other emergency response equipment is available for student use.

## ■ Brick Tower

A 62-foot tower is used for vertical high-angle and confined space operations, featuring an elevator shaft that can be changed from a standard shaft to a confined space prop. The exterior provides lowering and pick-off operations, rappelling, and extensive rigging exercises.

## ■ Steel I-Beam Tower

The 72-foot tower is utilized for vertical high-angle operations. Students encounter rappelling, line transfers, highlines, pick-off, basket, and extensive rigging operations.



## ■ Horizontal and Vertical Vessels

The horizontal vessel is used for confined space operations. The outside has six manways with diameters from 18 inches to 36 inches. The inside configuration has split levels, manway opening and a large sump area. Students encounter vessel entry, ventilation practices, air operations and medical considerations in a confined space.

## ■ Rail Car

The rail car is used for confined space operations in both municipal and industrial training.

## ■ Three-Story Complex

The three-story complex features a two-story apartment with three rooms downstairs and two rooms upstairs, multiple closets, an elevator shaft and external/internal stairs and ladders. This project provides a live fire situation emphasizing heat and low visibility. Students learn the proper use of equipment, attack methods, approaches, and rescue operations, as well as ventilation techniques, the use of acceptable procedures, and the Incident Command System.

## ■ Garage & Cottage

This project utilizes Class A combustibles for all scenarios. The prop is combated with water-based extinguishing agents and Class A foam application.

## ■ Ship

The 300-foot ship mock-up is three decks high and encompasses a multitude of enclosed fire simulations. A 175-foot forward deck simulates a typical tanker with numerous live fires: burning barrels, overflowing expansion trunks, manifold fires, confined and unconfined spills on deck, cargo tank fires and simulated electrical fires.

The fully enclosed, three-story structure features various hydrocarbon and simulated electrical fires. This prop includes a fire at the boiler front, a broken fuel line on a diesel engine, and a leaking duplex trainer. It also includes a fire at a fuel oil purifier, a fully involved bilge fire and simulated class C fires at an air compressor and electrical distribution panel.

## ■ Aircraft

This prop includes a small and a large spill area. The large spill area features a 72-foot fuselage with first class and coach sections, bi-level wings, tail section, and cockpit for integrated fire suppression and rescue drills. The small spill area consists of a small fuselage, wheel/brake assembly, and engine. At 5,400 square feet combined, this prop offers the largest pit fire for training in the United States. It supports the coordinated efforts of monitors, hose lines, and ARFF trucks to knock down, contain, and extinguish fires.

## ■ Disaster City

Disaster City is the only full-scale urban simulation of its kind. The props allow for comprehensive, coordinated training scenarios. The city includes a collapsed office complex, strip mall, single-family dwelling, a rubble pile covering eight tunnels, and even derailed passenger and freight trains.

For further information  
please contact:

### Emergency Services Training Institute

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# Vehicle Extrication

More than just “How many ways can you mutilate a vehicle?”

*Pic courtesy of Emergency Services Training Institute*

**By Harvie Cheshire, Municipal Programs Coordinator  
Emergency Services Training Institute, Texas Engineering  
Extension Service, The Texas A&M University System**

YOU ARE DISPATCHED TO the scene of a motor vehicle accident. As you respond you think back to all of the situations you have faced before; you wonder how the accident you're approaching will resemble those previous incidents, and your mind spins through the possible responses and mitigation factors that will be unique to this situation. You have countless hours of training, many years of experience, and hundreds of thousands of dollars worth of apparatus and equipment at your disposal. When you're finally on-scene, you will have an important choice to make: which tool will be best for the job.

The natural inclination of any rescuer is to leap into action. After all, victims' lives are often at stake and time is often limited. But that same delicate situation requiring you to act swiftly also requires you to act intelligently. The most powerful tool available to you at any scene is your brain, and some of the most important training you can do will be to prepare yourself to think clearly and dispassionately through any situation you face. Long before the alarm is raised and you are dispatched, you must first build the foundation for making informed, sound, and precise command decisions while mitigating a motor vehicle accident scene.

First, you must be able to recognize

three distinct response operations:

- 1. Extrication.** Extrication is the process of safely and efficiently freeing persons, pets, or livestock from entrapment in land-based vehicles of all types.
- 2. Disentanglement.** Disentanglement is a part of extrication, as responders remove or manipulate vehicle components to allow a properly packaged victim to be removed from the vehicle.
- 3. Rescue.** Rescue is also a part of extrication, as responders assess, stabilize, protect, and remove a victim from entrapment.

Knowing the differences and understanding how each operation contributes to the overall effort is critical to a successful rescue or routine recovery mission. Then by combining your general knowledge of broad operations with state-of-the-art training, equipment, and apparatus, the specific procedures appropriate to individual incidents will be more apparent and less overwhelming.

Next, we all must be able to understand and evaluate (size-up) the nature, extent, and component challenges presented by a specific incident. Remember that as a rescue professional, you may or may not be in the fire service. You may be a career firefighter, but you may also be employed by a private ambulance firm or part of a volunteer rescue squad, and as such you are likely to be first on-scene. Furthermore, you could be there long before any officer or supervisor can arrive to take command of the scene. It will be up to you, the first arriving unit, to perform size-up, establish the basis for an Incident Management System to control the scene, and to begin response operations. With that in mind, so long as you remember the three following incident priorities, you cannot go wrong:

# Vehicle Extrication

**1. Life Safety.** Above all other considerations, the safety of you, other rescuers, passers-by, and incident victims has to be accommodated. Your rescue personnel **MUST** be protected. Remember, if we don't take care of and protect ourselves, how can we protect those we have taken an oath to serve? Make sure first that you protect the scene with lights, cones, tape, vehicles or what ever measures your department/agency have set forth by Standard Operating Guidelines. Once the scene is secure from possible accidents occurring, we must insure our personnel involved in the extrication and disentanglement phase are protected from head to toe. This means they must be equipped with NFPA approved head protection, eye protection, hearing protection, body protection, foot protection, hand protection and when indicated, respiratory protection.

**2. Incident Stabilization.** After accounting for the safety of everyone on-scene, your responsibilities will be to identify conditions that may be deteriorating or threatening to deteriorate and to take steps to stabilize those conditions.

**3. Property Conservation.** Once life safety and stabilization issues are addressed, you can begin to think through the ways the ensuring that final operations will not endanger property.

The following questions enable you to sort through the dizzying array of information that confronts you at the scene:

- What has happened?
- What is happening?
- What is likely to happen?
- What hazards can be mitigated?

- What resources are needed?
- What is the correct address of the incident?
- What is the nature and scope of the incident?
- How many victims are there, and what is their status?

Once you have secured the scene and evaluated the extent of operations necessary to extricate the victims, you must consider how you will gain access to anyone trapped in the wreckage, and you must consider how you will extricate them. Combining the response information with the time of day and weather conditions, will give us a good idea as to the needed resources to assist us at the scene. Proper resource allocation is critical upon arrival as to speed up the extrication process.

Up to this point you have been cautious and deliberate in your actions, exercising crucial restraint against your natural temptation to bring out the big tools and get right to work. Even though you're at the access and extrication phase, however, you still must consider with care the strengths and weaknesses of the tools to which you have access. Will you use the electric power tools, the motor driven tools that have a power unit, or a simple pry bar? Will you use the popular air bags for support, or just plain 4x4 wooden cribbing material? Above all, remember that you need not call for the most powerful hydraulic/power tools available to you simply because they are available to you. Quite often, simple tools can facilitate operations, sometimes more expeditiously. A steering wheel can be pulled off of driver's lap using only a length of rope or chain, a spare tire, and the leverage provided by the car's hood. While it's certainly true that powerful tools are often necessary, remember that as power increases, so does the threat to life safety. A spreader may be able to pull a car open easily, but in so doing it's likely to generate dangerous shrapnel.

At the same time, it's important to note that the scene is not the place for experimentation. We have all had our experiences with improvisation and we can all share those same experiences with our fellow professionals, experi-



*Pic courtesy of Emergency Services Training Institute*



ences like using two wreckers to pull apart seriously entangled cars. But the rescue scene is not the place to “try new things” or to test innovations when established practices will do. Remember that we are responsible for lives. The victims’ lives hang in a very delicate balance, and the lives of other personnel at the scene may be imperiled by unconventional actions; in both cases, lives depend upon our actions and inactions.

If you have done your preparation phase, your response phase and your initial size up phase correctly, the answer will be self evident. Address the following questions:

- How long has the victims been in the vehicle?
- What potential hazards are present? (that could prevent use of certain tools)
- How big of an opening do I need in order to safely extricate?
- How much time will it take to set up the tools?
- What is the makeup of the vehicle? (Construction)
- What type of SRS devices must I be concerned with?
- Where is the vehicle’s most vulnerable (weakest) point?
- Is cutting the car necessary, or can I simply unlock and open the door?

Keep the following quote in the back of your mind at all times: “Control the situation, or the situation will control you.”

As you can see, vehicle extrication/rescue is much more than just seeing how many ways you can mutilate a vehicle with power tools. Before you embark upon this type of mission, you MUST remember that your brain is the most important tool, apparatus, or piece of equipment you have to work with, and you must have it ready to go. We are creatures of habit, and when confronted with emergency situations we will fall back on those habits as we were trained, good or bad. So how can we be best prepared for this type or any type of emergency response? The answer is simple: train regularly and practice with precision.



*Pic courtesy of Emergency Services Training Institute*

When you respond to an incident, your decisions and responses should be limited to the specific details of the incident. You should not be trying to figure out what you need to do and when you need to do it; rather, your training should prepare you to identify the on-scene considerations that are important to you as well as when those considerations are important. Life safety, for example, is the most important consideration and should be addressed before anything else. Once your training has prepared you to make certain decisions in a certain order, you can concentrate on-scene to the specific and unique details of the incident that affect those decisions. The following operational phases should be automatic:

- Establish the scene
- Establish fire protection
- Isolate potential energy sources (and other hazards)
- Stabilize the vehicle
- Determine vehicle access/egress and openings
- Create access/egress openings
- Disentangle victims
- Remove packaged victims to safety
- Transport victims to a hospital facility

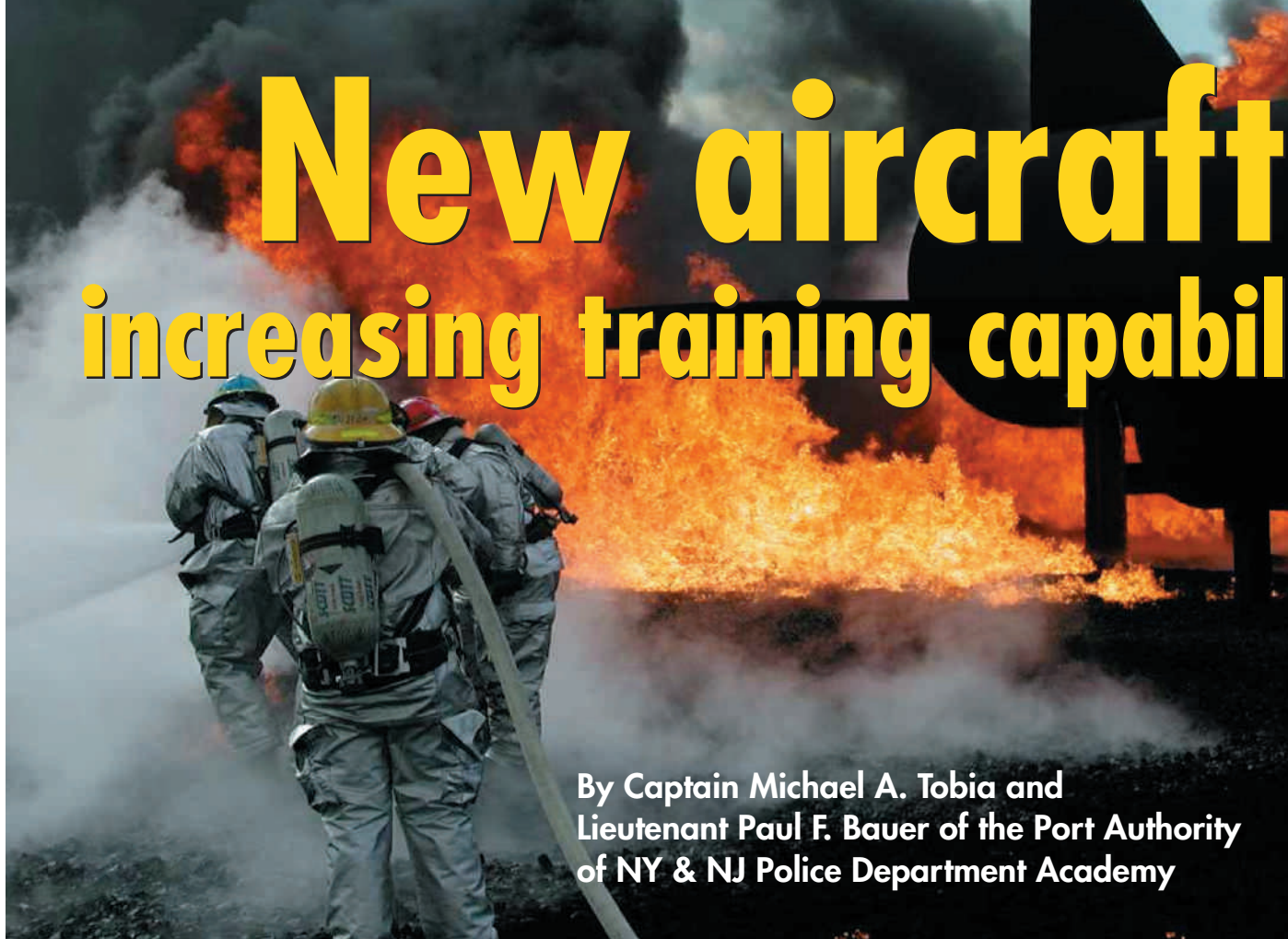
Once you have been freed from figuring out how to think about an

incident, you will better be able to think about your specific response. And this will save you from the temptation to start cutting with the largest tool you can get your hands on as soon as you arrive. Knowing how to think about and mentally organize the barrage of information you must absorb when you arrive will save you from tunnel vision, from ignoring the information you aren’t ready to process and trying to gain access to the victim without fully evaluating the scene and identifying the exact tools required.

**Train like your life depends on it . . . because someone else’s will some day.**

Harvie Cheshire is a career fire service professional with 27 total years of experience, both volunteer professional and full time paid professional. Harvie possesses an Associate of Applied Science Degree in Fire Safety Administration from Navarro College in Corsicana, Texas, and 22 professional certifications, 3 at the Master Certification Level. Harvie is the Program Coordinator for the Municipal Fire Programs and the Recruit Fire Fighter Academy Master Chief Instructor at the Emergency Services Training Institute (ESTI) in College Station, Texas. Harvie has been employed by ESTI for the past 10 years.

# New aircraft fire training increasing training capability



By Captain Michael A. Tobia and  
Lieutenant Paul F. Bauer of the Port Authority  
of NY & NJ Police Department Academy

*Pic courtesy of Port Authority of New York*

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY operates three of the busiest airports in the United States: John F. Kennedy International Airport (JFK), LaGuardia Airport (LGA) and Newark Liberty International Airport (EWR), which combined to served about 81 million passengers in 2002. The Port Authority's responsibilities include providing sufficient services to ensure efficient operation of the airports and the safety of millions of passengers, airport operations personnel, and employees of the many vendors and FBOs.

The Port Authority of New York & New Jersey also operates some of the busiest and most important transportation links in the New York metropolitan region. In addition to the three commercial airports, the agency operates Teterboro Airport; the George Washington Bridge; the Lincoln and Holland tunnels; the three bridges between Staten Island and New Jersey; the PATH rapid-transit system; the Downtown Manhattan Heliport; Port Newark; the Elizabeth-Port Authority Marine Terminal; the Howland Hook Marine Terminal on Staten Island; the Brooklyn Piers/Red Hook Container Terminal; and the Port Authority Bus Terminal in midtown Manhattan. The agency also owns the 16-acre World Trade Center site in Lower Manhattan.

The agency's police department, which is responsible for ensuring the

safety and security of these facilities, also provides Aircraft Rescue Fire Fighting (ARFF). About one-third of the 1,800-member force is trained as ARFF personnel, in addition to its other police training.

Prior to 1998, Port Authority ARFF personnel trained at a pit located at JFK. Centered in the pit was a round cylinder, simulating an aircraft fuselage.

*Prior to 1998, Port Authority ARFF personnel trained at a pit located at JFK. Centered in the pit was a round cylinder, simulating an aircraft fuselage. Instructor personnel would apply 300 to 400 gallons of Jet A topped with 5 gallons of gasoline to the pit, and touch it off with a couple of flares.*



# fire simulator: y at New York area airports



Pic courtesy of Port Authority of New York

Instructor personnel would apply 300 to 400 gallons of Jet A topped with 5 gallons of gasoline to the pit, and touch it off with a couple of flares. Before the training evolution was completed, nearby residents would often call, curious about the huge plumes of black smoke coming from the airport.

In June, 1998, the Port Authority accepted a propane-fueled, computer-controlled fuel-spill-fire trainer provided by Symtron Systems of Fair Lawn, New Jersey. This trainer consists of a 125-foot diameter burn area with a 737-size fuselage mockup with a broken wing centered in the burn area. Since propane burns relatively cleanly, fuel-spill turret and hand-line training can now be conducted without the black smoke and subsequent telephone calls.

In addition to solving the environmental problems of smoke and pollutant runoff, the system provides numerous training advantages for instructor personnel. The computer-controlled system permits standardized

evolutions to be presented to all trainees, and the performance of all trainees can be evaluated objectively and logged. In the event of critical errors by the trainee, the evolution can be stopped, remedial instruction given, and the evolution resumed or restarted. The system also incorporates numerous automatic safety features.

The Port Authority has recently contracted again, with Symtron Systems, for a Specialized Aircraft Fires Trainer, or SAFT. The SAFT will have the

dimensions of a 757 aircraft: 75 feet long and 13 feet in diameter. The trainer will be capable of producing 12 training fires plus a flashover in the main cabin. These "fireplaces" are main cabin, port and starboard sides; wing engine; landing gear with a "blow-out" plug; cockpit; galley; lavatory; baggage compartment; APU; tail-mounted engine; 3-dimensional fuel leak; electronics bay; and cargo area. A portion of the funding for this training system is provided by a U.S. Federal Aviation

*In the event of critical errors by the trainee, the evolution can be stopped, remedial instruction given, and the evolution resumed or restarted. The system also incorporates numerous automatic safety features.*

# New aircraft fire simulator: increasing training capability at New York area airports



Pic courtesy of Port Authority of New York

Administration (FAA) grant, administered under the administration's Airport Improvement Program.

The Port Authority Police Department's training load has always been heavy. For the past 18 months, that load has increased dramatically due to a number of factors, including the loss of 37 officers and commanders who

responded to the terrorist attacks on the World Trade Center on September 11, 2001. Today, approximately 600 Port Authority personnel train at the center twice each year, and the center provides training for approximately 80 ARFF personnel from other organizations each year. Recruit replacements undergo the normal 25-

week police training program *plus* one week of a Basic Firefighting program. Once in service, up to one third of the department will attend a more specialized 3-week Basic Aircraft Rescue and Fire (BARF) program, which consists of one week of classroom study and the remainder at the JFK live-fire training center. So, with the

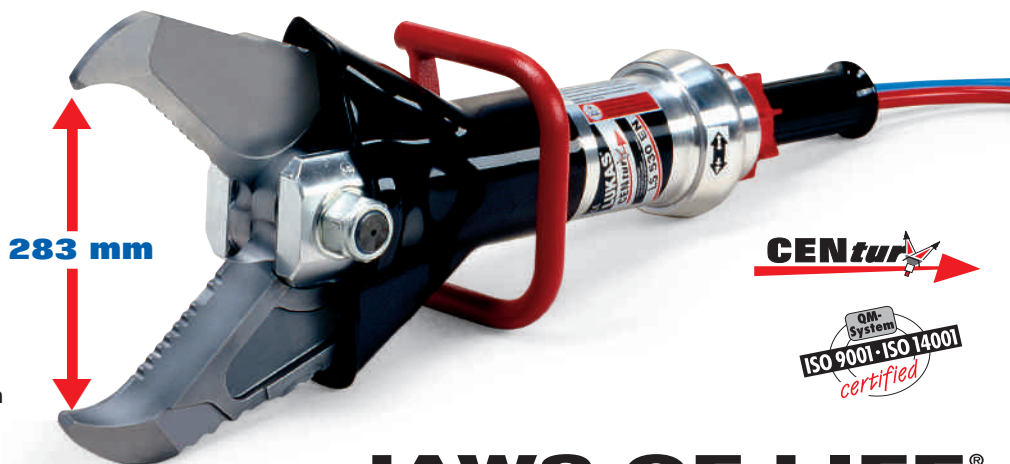
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*Once in service, up to one third of the department will attend a more specialized 3-week Basic Aircraft Rescue and Fire (BARF) program, which consists of one week of classroom study and the remainder at the JFK live-fire training center.*

twice-annual refresher training of all personnel, the recruit training and the training provided to "outside" personnel, this enormous training load means that the center is conducting "burns" approximately 200 days each year.

As with most public safety organizations, the Port Authority is constantly upgrading its equipment. The training center has proven to be invaluable in introducing ARFF personnel to use of new equipment under very realistic conditions. Similarly, some of the agency's new crash-rescue trucks are equipped with the "snuzzle" devices;

the training systems permit realistic practice in the use of this effective tool, as well as many others.

Airport personnel, including these police firefighters, face ever-increasing challenges in today's world. Firefighters know they may be called to respond to aircraft accidents and situations resulting from terrorist activities. Nowhere is this challenge greater than in the New York City area. The Port Authority's practice of employing personnel trained in both policing and firefighting duties provides an advantage in expertise and flexibility in facing that challenge. The

training required is intense and extensive. The Port Authority believes the new fire simulator will be an effective component of that training.

Captain Michael A. Tobia is the commanding officer of the Police Academy for the Port Authority of New York and New Jersey. His 23-year career includes participation in the specialized counter terrorism unit of the PA. He holds a Bachelors degree in law enforcement and a Masters degree in Education.

Lieutenant Paul Bauer is the Executive Officer of the Police Academy. During his 23-year career, he performed critical research and planning in the area of fire training. He holds a Bachelors degree in Business and a Masters degree in Education.

Originally printed in *International Airport Review*, Issue 1, 2003.

Symtron Systems is now known as Kidde Fire Trainers – please see update on p. 62.

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## "KIDDE FIRE TRAINERS" IS LAUNCHED

IFTE (International Fire Training Equipment) Limited, Symtron Systems Inc., Symtron GmbH, and ICS (International Code Services) are now offering their products under the name "Kidde Fire Trainers."

Acquired by Kidde plc in September 2003, the company is the leading provider of live fire training systems and centres for firefighting, with offices in the USA, Canada, UK and Germany.

Kidde's live fire training systems, controlled by computer and fueled by kerosene, propane or natural gas, allow realistic fire training in a safe and environmentally sound manner. These training systems have been widely adopted by municipal, airport, and industrial fire departments as well as military and maritime fire training organisations worldwide.

Kidde Fire Trainers has delivered more aircraft fire-training rigs than any other supplier, worldwide. Key airport customers include: London Heathrow, Schiphol, New York – JFK, Frankfurt, Athens, and most recently London Gatwick Airport to name but a few. Each training facility, whether static, portable, modular or retrofit is purpose-built to the exact customer specification. It is capable of accurately creating all of the drama and realism of a real fire and disaster scenario whilst maintaining total safety and complete operator control.

## Kidde Rental Solutions

If you need to upgrade or install a new fire training facility but cannot get an allocation from your capital budget, then look no further.

Kidde Rental Solutions is a service provided by Kidde and CitiCapital, working together so that you can rent the right equipment with no capital outlay.

Choose Kidde Rental Solutions, and you will have a tailored Kidde facility installed for you under a Minimum Term Rental Agreement. No capital outlay is required. Service will also be provided and covered by a separate agreement. The combination of these two agreements will give you the complete peace of mind that comes from knowing that Kidde is keeping the whole system fully operational in compliance with its specification.

To find out how it can help you and to have any questions that you may have answered, please call us today to arrange a free no-obligation meeting.

Kidde Fire Trainers is a proud sponsor of the International Aviation Fire Protection Association (IAFPA).

**For more information, please contact:**  
Peter Gould, Sales Manager  
Tel: +44 (0) 1246 242700  
Email: peter.gould@kiddeft.com

## LUKAS® LTR 12/575 EN AND LTR 12/875 EN HIGH PERFORMANCE TELESCOPIC RAMS



**World's first family of telescopic rams with a lift capacity of 12 t resp. 24 t**

With their lifting capacity of 24 t resp. 12 t LUKAS CENTury Telescopic Rams offer maximum performance reserves, much more than required by most modern car models. The most powerful Telescopic Rams with unsurpassed low weight.

### Recommended applications:

- Road traffic, railroad, aircraft, naval accidents
- Building rescue and disaster management
- Moving obstacles, lifting

loads, creating man-holes and stabilizing

### Highlights:

- All telescopic ram models have 12 t lifting capacity with the second piston
- Minimum retracted height but enormous lifting height through telescopic design.
- Reach lifting height of two standard rams with one stroke
- Less weight: one telescopic ram instead of two standard rams
- Less time required: no need to switch from one model to another



- Precise operation in any working position with your finger tips
- Professional telescopic technology of world's largest rescue tools' manufacturer

## Technical Data

### LTR 12/575 EN (instead of short and medium standard ram)

Total extended length	41.4 in/1055 mm
Stroke/lifting cap. piston 1	11.6 in/53, 950 lbs – 295 mm/240 kN
Stroke/lifting cap. piston 2	11 in/26, 980 lbs – 280 mm/120 kN
Total stroke	26.6 in/575 mm
Oil requirement	89 cu in/1440 cm <sup>3</sup>
Dimensions retracted l x w x h:	18.8 x 4.4 x 8.3 in – 480 x 112 x 211 mm
Weight:	36.8 lbs/16.7 kg

### LTR 12/875 EN (instead of medium and large standard ram)

Total extended length	59 in/1505 mm
Stroke/lifting cap. piston 1	17.5 in/53, 950 lbs – 445 mm/240 kN
Stroke/lifting cap. piston 2	16.9 in/26, 980 lbs – 430 mm/120 kN
Total stroke	34.5 in/875 mm
Oil requirement	130.5 cu in/2139 cm <sup>3</sup>
Dimensions retracted l x w x h:	24.8 x 4.4 x 8.3 in – 630 x 112 x 211 mm
Weight:	46.1 lbs/20.4 kg

Ram Support LRS 120 Weight 20.7 lbs/9.4 kg

Ram Support LRS-C Weight 15.5 lbs/7 kg

LUKAS Hydraulic Pumps are set to a system pressure of 630 bar. Acc. to DIN and prEN standard the working pressure can be increased at 10%. If the tools are operated with the increased working pressure (693 bar), also the tool forces would increase by 10%.

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## "BUFFALO" SERIES AIRPORT FIRE TRUCKS



Although the majority of airports keep steadfastly to the concepts of ICAO or NFPA, there are smaller domestic or military airports (with the exception of some Scandinavian countries) that prefer to use more cost effective fire fighting trucks, and these are produced on a commercial based chassis.

These trucks are normally adapted from the standard chassis, usually with crew cabs, single rims and fitted with the maximum available power packs as well as automatic transmission to meet some of the basic needs of the ICAO specs, but usually not all.

Airports up to Category 5 are often using these type of trucks, and they are very popular for use as an RIV, using mainly either the Scania P124 chassis or the Mercedes Benz 1328, both of which offer pump and roll with single rims and fully automatic transmission, and with the correct capacity can offer acceleration of 0-80 km/hr in 25 secs.

The basic requirements in terms of tank capacity, discharge rates and complimentary agents re still met in most cases, but the cost level is of course much lower, and will result in a cost base of around half to two thirds of that of a full crash tender.

**For more information, please contact:**  
Sales

Tel: +65 686 20273

Email: sales@skfire.com



## TYNE AND WEAR FIRE SERVICE GET THE "BIGGER PICTURE"



*When you raise the subject of improving Fire Service efficiencies using ICT, the majority of us would assume we are discussing the use of computers back at the Station. However, in Tyne & Wear, the Fire Brigade implemented interactive whiteboards in their command support vehicle in the search for greater speed and efficiency of Command decision making.*

Tyne & Wear Metropolitan Fire Brigade is one of the leading players in Community Fire Safety and Arson Reduction work, as demonstrated in their 'Community Fire Station' initiative. The Brigade provides a lead to the fire service as a whole in a number of areas, such as equipment development and operational delivery, and currently with the Command Support Unit.

Assistant Chief Fire Officer Iain Bathgate decided to look to bring things up to date, with the use of technology. The Fire Services Act requires the Tyne and Wear Brigade to keep information on risk premises. However, as with the majority of fire brigades, the premises' tactical plans were in paper based files. With all fire incidents speed is vital. Using old manual systems, incident planning and identification of the potential risk within a building took time.

Post incident reviews and de-briefs involved redrawing the premises, and mapping out the stages of the incident. In an attempt to improve the effectiveness of their own internal performance, Operations Department Officers reviewed the command support role, and visited other Brigades to view best practice initiatives.

The first area to focus on was the command support vehicle. With consideration of technological innovation, Tyne & Wear had an overall vision of replicating the risk premise's plans and information and moving it from a paper based system to an electronic system with a range of information-rich media relating to each premises.

Suppliers of their MODAS system, Petards translated these requirements into an implementation plan, and identified MODAS with a SMART Board™ for Plasma Displays as the key resources in the new command vehicle.

Because SMART Technologies are the pioneer and consistent market leader of large display collaborative technology, and because of its success with other fire services, the SMART Board was the natural choice. "In situations of high alert, a complex technology would have failed" explains Iain. "The instinctive natural application of the SMART Board was perfect."



With the implementation of the SMART Board, Tyne & Wear used the MODAS software to instantly select the appropriate location, and view the premises on the plasma screen. By using the electronic pens, or by touch, the premises image could be annotated over, without having to go manually through a filing index. Any activity can be edited and saved as a record of the incident, recording its status at each stage. Each of these snapshots is automatically time and date stamped.

Station Officer Alan Robson commented "I am delighted with the SMART Board overlay which has proven ideal for its purpose because of its natural functionality – it's really a matter of point and write. I was very aware that if the operation of the overlay was too complex, people would shy away from its usage, and the benefits would not be optimised", explains Alan. "Because SMART use tool bars like those used in Microsoft applications, its functionality is fairly obvious to even non-technical members of the Brigade.

For additional information visit [www.smartboard.co.uk](http://www.smartboard.co.uk)

**For more information, please contact:**  
**Kevin Gladwin, Business Development Manager**  
**Steljes Group**  
**Tel: 020 8213 2100**  
**Email: [kevin.gladwin@steljes.co.uk](mailto:kevin.gladwin@steljes.co.uk)**

## VEMA LIFT OY – MEMBER OF KIITOKORI GROUP, FINLAND



Is rapidly increasing its market share with Aerial Ladder Platforms in Europe and in Asia.

Vema Lift Oy is one of the world-leading manufacturer of Aerial Ladder Platform vehicles for Fire and Rescue Departments.

Vema Lift Oy was established in 1989 as a relatively small entrepreneurial designing, engineering and manufacturing company of advanced and innovative Hydraulic Aerial Platforms.

Vema joined the well known Finnish Special Vehicle Group – Kiitokori in 1998. Since that date Kiitokori started aggressive investment and development programs of increasing the human resources and capabilities within Vema's marketing, engineering R&D, production and quality systems & controls.

Those investments and development programs are starting to show positive results, as to-day Vema is rapidly moving towards becoming a leading European Aerial Ladder Platform manufacturer with its new and revolutionary TFL Range for Fire Fighting and Rescue Departments, in Europe and in Asia.

Vema has now successfully opened up Central European and Asian markets by receiving major orders from countries like, Switzerland, Germany and Holland in Europe and China, Taiwan and Singapore in Asia.

Vema's present new revolutionary TFL Range includes six standard models of Aerial Ladder Platforms with working heights of 27 meters, 32 m, 33 m, 38 m, 45 m and 55 meters. All the models are representing top-on-the-line technology with computerised controlling and monitoring systems to choose from. They have a variety of technical/functional features and options and each model can easily be adapted to a specific local need of the Fire & Rescue Department.

Vema TFL range new revolutionary features includes:

- Low GVW in overall design together with short vehicle length make it easy to manoeuvre in traffic ensuring a quick arrival at the rescue location
- Stabilizing outriggers can be freely placed according to the space available.
- Radio controlled Automatic levelling of the vehicle within a few seconds.
- Long second boom together with additional third boom design allow access to the even most difficult targets.
- Radio controlled water monitor
- V.O.C. outreach control system
- Roomy cage for fire fighting and rescue operations, with:
  - Four entry doors
  - Wheelchair and stretcher accommodation
- Automatic boom ladders, equipped with automatic rungs in-line feature.
- Heating of the telescopic water piping up to the cage. Patented system against ice building down to -30°C

Highly durable, state-of-the-art, and easy to service, Vema platforms are safe investment. Overall, Vema is an economic investment with solid price-quality ratio.

Vema Aerial Ladder Platforms have proven as most reliable, safe and functional fire & rescue platform solutions in the world market.

The effort has not been futile. The feedback from the market and end users has been highly positive – and when the feedback comes from the world's top professionals, it can justifiably be regarded as a vote of confidence.

All Vema units can be installed on most common commercial chassis.

Vema Lift Oy has just started new factory – Vema Components. This new factory will be solely in charge of Vema's heavy duty component manufacturing & fabrication, like the booms, turntable, sub-frames, outriggers etc. The new factory will operate with newest modern machinery, like automated/robotic plasma-welding lines etc.

This new investments will tremendously increase Vema's price & quality control as well as flexibility & reliability of delivery scheduling.

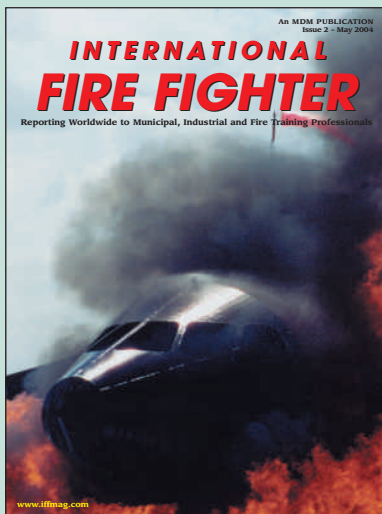
Vema Lift Oy is ISO 9001 – 2000 Edition certified company and all Vema products have been CEN certified.

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# TFL Aerial ladder platforms for fire fighting and rescue purposes.

TFL Range from 27 meter to 55 meter height.

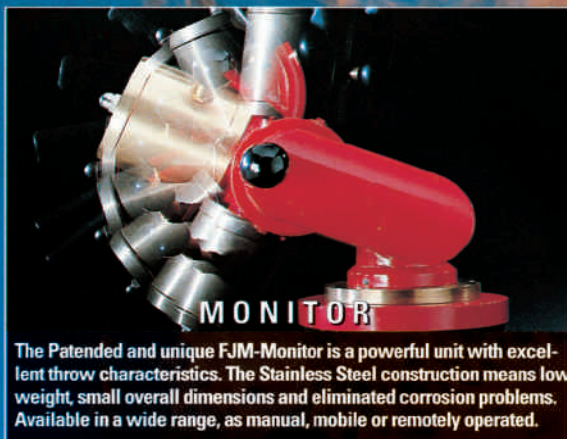


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Svenska Skum has developed and manufactured fire fighting equipment since 1933. From a unique component to a large installation providing fire protection to an oil harbour, a refinery an aircraft hanger or a ship.

A continuous focus on research and development has brought Svenska Skum to the forefront in the design of new fire fighting technology.

The unique products that have been developed over the years and that have been introduced to a wide range of markets has made Svenska Skum a symbol of innovation and quality.

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## COMMENT

Well, here we are again. Issue 3 who would have thought that just under a year ago when we started with our idea that we are now nearing IFF's first year of publication. It certainly has been a busy 12 months with three major trade exhibitions under our belt and a further two before the close of 2004. The response to IFF from both readers and advertisers has been overwhelming. It is also with great delight that a few of our advertisers have been contacted and asked for quotations thanks to IFF. This is the sort of news that goes to prove that the research on our readership database has proved worthwhile. Thank you both to our readers and advertisers for the support you have given us over the last 12 months.

Mark Bathard  
Sales and Editorial Manager



**MID-MATIC** Automatic Nozzle with pistol grip flows 70-200 gpm (265-760 l/min) at 100 psi (7 bar). Low pressure version has the same flow range at 75 psi (5 bar). Includes flush without shutting down, six detent flow positions, gasket grabber and full-fill fog.

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**BLITZFIRE** 500 gpm (2000 l/min) personal portable monitor with safety shutoff. Six detent flow positions, elevates 10 - 50 degrees above horizontal, rotates 20 degrees each side of center and works well with smooth bore or automatic nozzles.

布利斯便攜式水力自擺消防炮流量為每分鐘500加侖（每分鐘2000升），具有安全關閉、六檔流量定位功能。炮頭仰俯角為10-50度，左右搖擺各20度。可裝疊層式組合炮頭和自動調壓式炮頭。



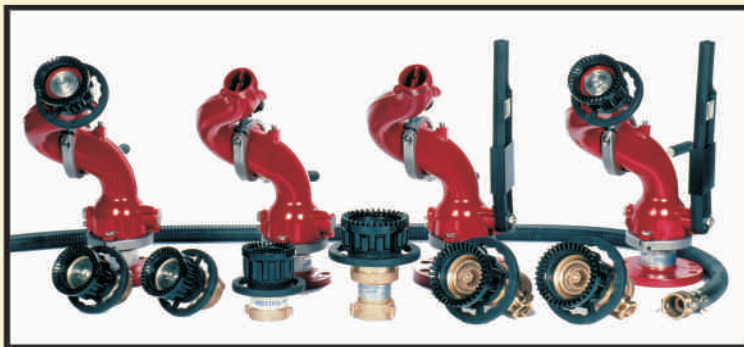
**CROSSFIRE** 1250 gpm (4500 l/min) portable / deck gun monitor comes with the Safe-Tak safety shutoff for maximum firefighter safety. Numerous inlets options and nozzles available to fit your specifications and fire fighting needs.

克魯斯便攜式/車載升降式消防水炮流量為每分鐘1250加侖（每分鐘4500升），具有安全關閉功能，最大限度地保護消防隊員的安全。可選各種進水口和炮頭來符合你的規格和滿足消防隊員的需求。



**PRO/pak** Portable Foam System is everything you need contained in on package that attaches to your 1" (25mm) or 1.5" (38mm) hose. Nominal flow is 12 gpm (45 l/min) @ 100 psi (7 bar) and works well with both Class A and Class B foam solutions.

PRO/PAK泡沫滅火器自帶所需組合附件，配用1英寸（25mm）或1.5英寸（38mm）軟管。在100 psi (7巴)壓力下，額定流量為每分鐘12加侖（每分鐘45升），可配用A類或B類泡沫液。



**PROTECTOR** 1250 gpm (4500 l/min) Fixed Station Monitor is available in brass or aluminum with or without on/off valve and built in nozzle. Rugged design, low friction loss and unique waterway delivers more water where you need it.

PROTECT固定式消防水炮流量為每分鐘1250加侖（每分鐘4500升），有銅質/鋁質、帶閥/不帶閥之分，裝有固定炮頭。堅固的設計、小的摩擦損耗及獨特的龍鐺已經為你需要時提供充足的水量。

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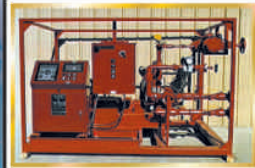
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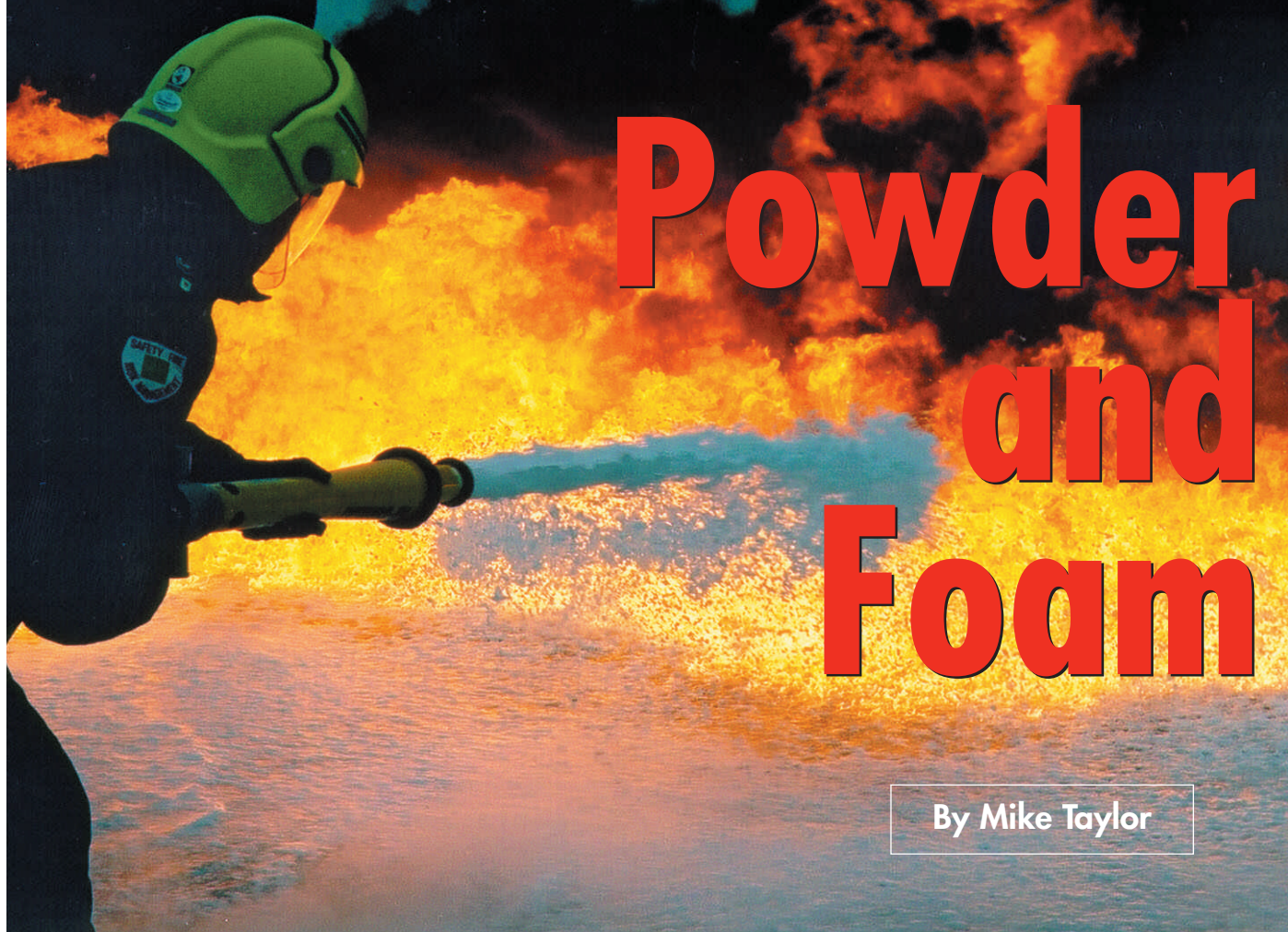


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# Powder and Foam

By Mike Taylor

*Low expansion branchpipe foam application*

**KERR FIRE FIGHTING CHEMICALS**, part of Kidde Plc, are world leaders in powder technology and also a major supplier of fire fighting foams. **Kerr Fire Fighting Chemicals** has been manufacturing fire extinguishing powders at its plant in Liverpool England for over 50 years. This article explains the technical aspects of fire fighting powders and goes on to introduce the most common types of fire fighting foams.

## FIRE-FIGHTING POWDERS

**F**ire-fighting powders are powdered chemicals with added substances to make them flow and stop them getting damp and lumpy. These chemicals will extinguish fires of liquids and gases, and some will also extinguish fires of solids like wood. Other specialist powders are available to extinguish metal fires (although these are not addressed in this article).

In the USA they are called “Dry Chemicals”, or sometimes “Multipurpose Dry Chemicals” for those powders which can be used on fires of solids and liquids.

### HOW DO THEY WORK?

Fire-fighting powders react with the substances produced during burning,

breaking the chain of combustion and stopping the fire. To take the example of the gas methane (“natural gas” used for cooking, etc); when this is heated (by a match) in the presence of oxygen in the air the methane ionises to form four positively charged hydrogen atoms (ions) and one negatively charged carbon atom (ion). Oxygen contains two atoms in the molecule, and these split to form ions, one with a small positive charge, and one with a negative charge. Two positively charged oxygen atoms combine with the negatively charged carbon atom to form carbon dioxide, and two positively charged hydrogen atoms react with the negatively charged oxygen atom to form water. The energy of this reaction is so great that it occurs as a fire. If finely

powdered sodium bicarbonate is introduced into the flame, the positive sodium ions formed combine with the negative oxygen ions, and break the chain of the reaction, stopping the fire. There is no cooling effect, as there is with foam and water, and no smothering effect, as there is with foam.

### ADVANTAGES OVER FOAM

A question often asked is what benefit does powder have over foam. First of all, powder has a much faster knock-down of a fire than foam. In addition, it can be used on live electrical risks, unlike foam. Powder is very effective at low temperatures where foam (which contains large quantities of water) can easily freeze. It also has benefits over foam on “falling fires” and pressurised fuel fires – burning petrol flowing from a tank, for example – which foam cannot extinguish.

Powder is also efficient on alcohol fires whereas many foams are designed only for hydrocarbon risks and will not be effective on alcohols unless a specialised AR type foam is used).



# Powder and Foam

## DISADVANTAGES OF POWDER COMPARED TO FOAM

Powder also has a number of disadvantages when compared with foam. There is nothing to prevent the fire reigniting after extinction. There is no foam blanket to give “post-fire security”.

There is no possibility of interrupting the application to take stock of progress – once you have stopped applying powder the fire will quickly return to its original size unless every flicker has been extinguished. With foam, if application is halted the foam blanket will contain the fire for a short period of time until application is restarted.

Powder cannot flow around objects sheltering flames. If an object in the fire blocks the jet of powder, and allows a small flame to continue

behind it, then as soon as powder application stops that small flame will reignite the whole area. Foam can often flow around objects, and extinguish fire behind them.

When used in engineered systems, powder takes up more room than most foam systems. Foam systems usually make use of the water supply to produce foam from concentrate, although there are “premix systems” which use diluted concentrate (foam solution).

Some poor quality powders have been known to cake in extinguishers, and this can mean that the extinguisher will not work at all. Even if the foam is of poor quality, foam extinguishers will usually work, so you have something to apply to the fire! It is therefore important to select high quality powder extinguishers approved to a suitable standard such as EN3 or UL.

*When used in engineered systems, powder takes up more room than most foam systems. Foam systems usually make use of the water supply to produce foam from concentrate, although there are “premix systems” which use diluted concentrate (foam solution).*

## TYPES OF POWDER

Powders used on fires of liquids and gases are called “BC” powders (B for liquids, and C for gases). These are usually made from sodium bicarbonate or potassium bicarbonate. Some are made from potassium sulphate, and potassium chloride.

A specialised high performance BC powder widely used around the world is called Monnex. Monnex powder is based on a potassium bicarbonate–urea complex and was originally developed by ICI in England. It is now manufactured and distributed by Kerr Fire Fighting Chemicals. Monnex has exceptional abilities on large flammable liquid fires (Class B and C) where superior fire extinguishing qualities and reliable protection is of paramount importance.

The extinguishing mechanism of Monnex is significantly different from other BC powders. As with BC powders, Monnex interferes with the chemical reactions which occur within the combustion zone. However, the unique property of Monnex is that within the combustion zone, the high temperature causes the powder to explode and break into minute particles giving a very large surface area which accelerates the extinction of the fire and the effectiveness of every particle of powder used. Monnex is the only powder to possess this unique beneficial property.

In the early days of foam it was remarked that powders would “kill” the foam formed from Protein foam concentrate, and so could not be used on a fire along with foam. This was found to be because of the anti-foaming action of certain water-repellency additives, used to stop the powder becoming damp. Special powders were made with different water-repellency additives which would not cause foam to collapse, and these powders were called “Foam-Compatible Powders”. Modern FP, AFFF and FFFP and AR type foams are fully compatible with all types of modern powder.

The powders, which are effective on fires of solids as well as fires of liquids and gases, are called ABC powders (or sometimes “General or Multi Purpose” powders). Class A means fires of solids (such as paper, wood, plastics and



furnishings). These powders are usually based on monoammonium phosphate, or a combination of monoammonium phosphate and ammonium sulphate.

ABC powders will fuse over the solid on fire, and melt over the embers, cutting off the oxygen supply and forming a crust over the surface.

These powders are also very effective on fires of liquids, but their efficiency depends on the content of monoammonium phosphate in the powder. Very effective powders contain 90% monoammonium phosphate, but much cheaper powders may contain as low as 20% monoammonium phosphate. This represents a huge difference when fighting a fire! It is important to appreciate that in powder technology that you do get what you pay for.

It is most important never to mix ABC powders with BC powders, because they will react together evolving carbon dioxide, which exerts extra pressure, and this will also cause caking of the powders preventing proper operation.

## FIRE-FIGHTING FOAMS

There are many different types of fire-fighting foam available to the fire-fighter reflecting historical development and the requirements of different applications. The earliest type of foam was a basic hydrolysed protein solution but this has more or less been replaced by more modern and sophisticated products today.

### FLUOROPROTEIN FOAM (FP)

Fluoroprotein foams (such as Fluoroprofoam) are basically protein foams with the addition of special fluorochemicals. These offer excellent heat stability combined with excellent fuel tolerance.



Local application of dry powder from a portable extinguisher



Foam being applied to an aeroplane fuselage from a Rapid Intervention Vehicle

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# Powder and Foam

This means they can be applied through monitors onto hydrocarbons and also via base injection into fuel storage tanks. Standard fluoroprotein foam is not suitable for use on water soluble risks. It is available in 3% and 6% grades. Fluoroprotein foams can achieve expansions up to approximately 40:1 but are normally used for fire fighting up to 10:1. More sophisticated versions have recently been developed which are capable of extinguishing fires involving MTBE. High performance versions are the standard foam for oil storage tank protection.

## AQUEOUS FILM FORMING FOAM (AFFF)

AFFFs (such as Filmfoam) were developed forty years ago specifically for crash fire situations where fast fire knockdown is vital to maximise chances of personnel rescue. They

combine fluorocarbon surfactants and synthetic foaming agents to give the foam solution surface tension characteristics which produce a thin vapour sealing film on a hydrocarbon liquid surface. This film spreads rapidly over the surface of a fuel resulting in fast flame knockdown (provided the fuel surface is not too hot, below 90°C. AFFFs are most effective on fuels with higher surface tension coefficients such as kerosene, diesel oils and jet fuels. AFFFs are formulated to drain foam solution quickly from the foam bubble to produce optimum film formation for rapid fire knockdown. To achieve this, long term sealability and burnback resistance are sacrificed to some degree. These foams are not well suited for oil refineries and oil storage terminals.

Standard AFFFs are not suitable for use on water soluble fuels. AFFFs are

*Fluoroprotein foams can achieve expansions up to approximately 40:1 but are normally used for fire fighting up to 10:1. More sophisticated versions have recently been developed which are capable of extinguishing fires involving MTBE. High performance versions are the standard foam for oil storage tank protection.*



Dry Powder application from a 75kg mobile extinguisher

available for 1%, 3% and 6% concentration usage. AFFFs can achieve expansions up to approximately 60:1 but are normally only used up to 20:1.

## SYNTHETIC DETERGENT (SYNDET) FOAM (SD)

Synthetic detergent foam concentrates are based on a mixture of synthetic foaming agents with additional stabilisers. They are very versatile in that they can be used to produce low, medium or high expansion foams. For this reason they are often referred to as "High Expansion Foam Concentrates". They have poor heat resistance and fuel tolerance and are mostly used for filling large voids using high expansion foam generators, where expansions as high as 1000:1 are achievable.

## FILM FORMING FLUOROPROTEIN FOAM (FFFP)

In order to combine the good stability and heat resistance of a protein base foam and the fast knockdown of a film forming one, some manufacturers have developed a Film Forming Fluoroprotein type (such as Centifoam). These combined benefits have meant that this foam type has become the choice for most modern aviation fire fighting applications.

## ALCOHOL RESISTANT FOAM (AFFF-AR AND FFFP-AR)

Polar solvents and water miscible fuels such as alcohols and ketones are destructive to standard hydrocarbon type foams because they extract the water contained in them and rapidly





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destroy the foam blanket. These fuels require a special type of concentrate generally known as “Alcohol Resistant”. Some of these have a synthetic AFFF base and some a FFFP base. Both types can be used, with the right application techniques, on hydrocarbon and polar solvent fires. They contain special polymeric additives. These additives remain in the foam until it comes into contact with the water soluble fuel. As the fuel extracts the water in the foam bubbles a tough polymeric membrane preventing the further destruction of the foam blanket on top of it is formed on the fuel surface.

The most common multi-purpose foams on the market are designed for 3% use on hydrocarbons and 6% on polar solvents. However, more recently products that can be induced at 3% on both hydrocarbons and polar solvents have become popular. These are widely used by municipal fire departments and petrochemical plants.

The application rate of foam solution for AR concentrates depends on the fuel being extinguished but it is normally higher than for standard hydrocarbon fuels. When purchasing foam concentrate for water miscible fuels it is important to consult the manufacturer regarding the correct application rate and percentage to be used for the fuels in question prior to finalising total quantity requirements.

## CONCLUSION

The choice between powder and foam for fire fighting applications depends upon a number of issues including speed of response and post fire security. Once the decision to use powder or foam has been made, there are then a number of decisions that need to be made based upon the fire risk and application technique.

Whatever decision the fire-fighter makes, as with all chemical purchases, product quality is critical. It is always recommended to use a supplier such as Kerr Fire fighting Chemicals, which has manufacturing process and quality control systems approved to BS.EN.ISO 9001 (2000) and has been in the industry for many years.



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# Communications – the vital requirement

By Bob Gaskell  
Helmet Integrated  
Systems Ltd

*Cromwell Echo helmet with integral cordless radio*

BY NATURE OF THE VARIED and extreme operational conditions they experience, the fire and emergency services have particularly demanding communications requirements. Confined spaces, high temperatures, high levels of ambient noise, all combined with the stress and rigour of the work being undertaken, make good radio communications a vital necessity.

Technological advances in hand-held radios have improved transmission and reception performance dramatically in recent years. However, 'line of sight' performance and signal strength are only part of the requirement, having less effect for example, in below deck marine fire fighting, or underground rescue operations, where ease of operation, close proximity teamwork, restrictions from other equipment being worn, and the ability to overcome high ambient noise levels are paramount.

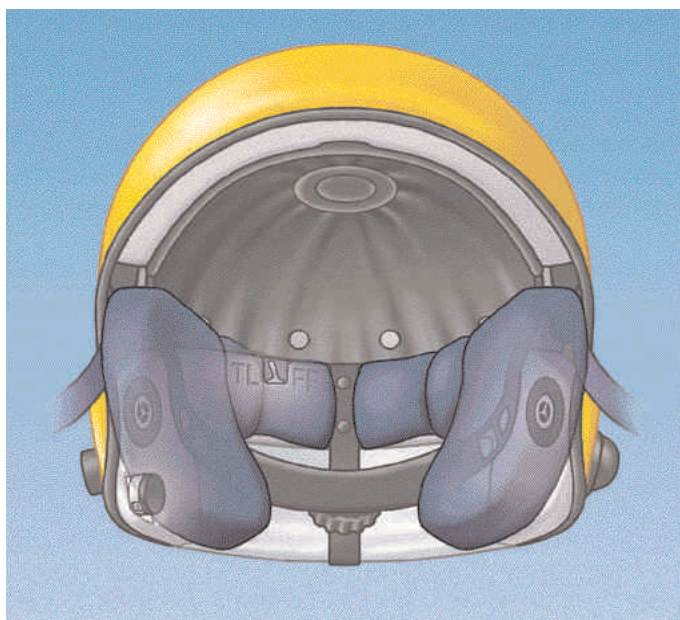
There are a number of interface options that enable a radio to be used in 'hands free' mode rather than directly through the integral microphone and receiver. The most common forms of interface are to fit a separate microphone and receiver to a breathing apparatus facemask, or to attach the components to the inside of the helmet by means of a headband. In both cases transmission is made via a push to talk unit (PTT), generally attached to the

protective clothing or harness, and connected to the radio via a download.

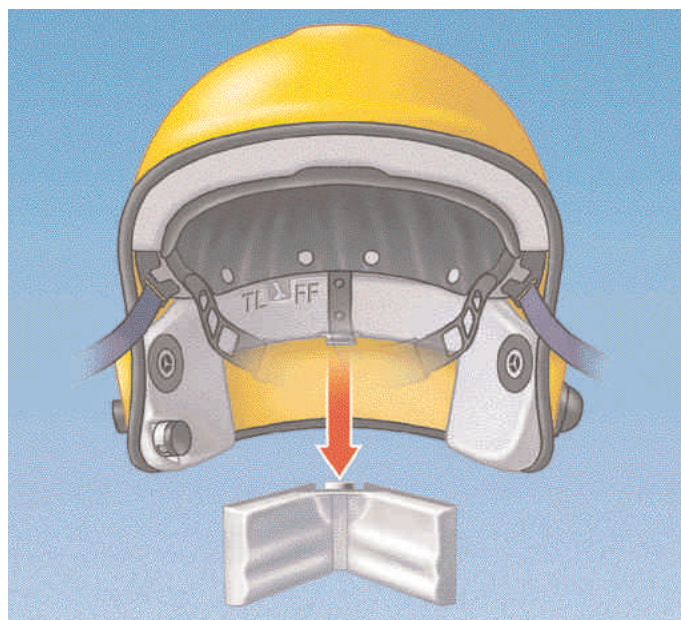
The main advantage of the head-band system is that this can be easily moved from helmet to helmet as required, and enables the system to be



*Headband radio system with push to talk unit*



*Duplex radio module contained within helmet*



*Integral battery provides up to four hours duration*

used during operations that do not require the wearing of a breathing apparatus.

Regardless of the advantages of the hands-free system, there are circumstances where the various connecting leads and components are considered a potential problem due to snagging or disconnection, and consequently a fully integrated helmet communications system is preferred.

The Enhanced Helmet Communication Operations (ECHO) helmet manufactured by Helmet Integrated Systems Ltd is an example of the capability to combine a hands-free, cordless radio communication system into a fire fighters helmet, providing operational control features that enhance both the performance and safety of the fire fighting team.

Originally developed for the UK Royal Navy, and now in use on all RN surface ships and submarines, the ECHO integrates a fireman's helmet with a two-way duplex UHF radio system that offers effective multi-way communications between individual members of the fire fighting teams, and the forward damage control position.

With conventional radios it is impossible to receive when transmitting or vice versa, and it is also very difficult to hear clearly in high noise areas. Although the ECHO has a line of sight range of 1.5 miles, the test parameter for use onboard ships was the capability of this radio to transmit clearly

between three decks and five bulkheads. This capability can be equally applied to non-marine uses where clear transmission between surface and underground locations is a necessity.

The duplex radio capability of the ECHO design, which is intrinsically safe certificated to Eex ib IIC T4, makes use of two transducer modules to produce a priority override facility. This is activated through the helmet, which incorporates a toggle switch enabling the radio to be set to either 'Team Leader' (TL) or 'Fire Fighter' (FF) mode, prior to entering the area of operations. Consequently all transmissions are overridden by those made from a helmet set to TL mode, enabling the designated team leader to pass instructions to all other members of the fire

fighting team with radios set at FF mode, and to the forward control/command position.

The override feature operates by establishing a higher transmission frequency *TXB* for the helmet set to TL mode, but continues to receive on the lower frequency *RXA* applicable to the FF mode.

Helmets set to FF mode, receive and transmit through one transceiver module, on the lower frequency *RXA* (receive) and *TXA* (transmit), but will also receive the higher transmission frequency *RXB*, on the second transceiver. Any transmission received on *RXB* will automatically switch off all *TXA* transmissions, enabling the Team Leader to be immediately heard.

The radio is constructed in modular two-part form, with earphone transducers fitted to the inside left and right sides of the helmet shell. These transducers have a tailored frequency response for maximum intelligibility, and are fitted with padded, passive noise-attenuating ear cushions that optimise wearer comfort and the clarity of voice reception in adverse conditions. An integral battery within the helmet powers the radio and is easily removed for re-charging, providing up to 4 hours operation depending on duty cycle.

By using a bone conducting microphone, located within the crown of the helmet, and enclosed in a noise isolation mounting, the transmissions are effectively isolated from high ambient



*Helmet incorporates bone microphone, antenna and push to talk (PTT)*



noise, and from the inhale/exhale noise of the demand valve, when wearing breathing apparatus. The integral shielded radio antenna is also located within the crown of the helmet.

It is a key requirement that the bone-conducting microphone should still continue to provide good transmission contact even when the helmet is used with a facemask and anti-flash hood giving two additional layers of contact between the microphone and the wearer's head.

A large push to talk (PTT) switch is fitted to the side of the helmet, and can be easily operated by a gloved hand. Importantly, the PTT, which has a 'time out' feature to prevent over-extended transmission times, can be depressed through the faceshield or hood of a coverall gas tight suit. An on/off volume switch is fitted to the outside of the helmet, which also incorporates a rotary switch, to give a choice of up to 16 frequencies with 12.5 kHz spacing for multi-channel operations.

A hand-held version of the helmet radio is provided for use by the control/command centre, and this duplicates all of the functions of the helmet unit. Under normal circumstances the handheld radio would be set in FF mode, however this can be quickly changed to TL override, should it be necessary for evacuation procedures to be initiated.

Communications capability can also be added to existing fire and rescue helmets by fitting a universal headset communications system which interfaces an existing hand-held radio to the helmet, offering a choice of either bone conducting or boom microphones.

The Signum adjustable headset, which incorporates the microphone and receiver, can be attached to the headband of the helmet, positioning the bone microphone to the crown of the head, and the receiver to either the left or right ear as required.

The headset is connected in turn to the PTT switch, ending in an extending down lead with connector appropriate for the make and model of radio being used. The headset can generally be configured to existing PTT switches providing that they are also intrinsically safe.

Transmission and reception clarity will be influenced by the performance of the radio used; however the use of the bone microphone within the helmet enhances the transmission, and minimises the effect of ambient noise.

The use of the PTT enables the wearer to easily activate transmission with a gloved hand or elbow or in some circumstances if necessary by contact with part of the structure being negotiated.

Other systems available utilise either voice activated (VOX) or earpiece microphones.

Regardless of the radio type or interface with the wearer's other protective equipment, the potential user has the opportunity to trial alternative systems, and establish the best combination for the 'worst case' operational conditions likely to be encountered. In each case choice and availability of operating frequencies, protection from environmental factors such as heat, water, dust and intrinsic safety considerations will shape the type of system to be required.

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HAZMAT

# DQE



# Hazmat Spills and Clean Up

By John Jones

*Anti-bacterial chemicals are atomized in the spray head to produce a fine mist*

## Making the right choices for decontamination

Decontamination has always been an integral part of the work undertaken by the emergency services – providing essential first aid for casualties and protecting their own personnel from the hazardous substances to which they are frequently exposed. This can range from relatively harmless substances that can be removed with no more than a simple wash down to highly dangerous chemicals requiring specialised treatment. Add to this the threat of terrorist activity with the risk of large numbers of casualties exposed to nuclear, radiological, biological or chemical agents, and the list of potential contaminants grows ever longer.

The days of the ‘one-size fits all’ response are long gone. Increasing sophistication in the types of threat and the growing range of hazardous substances involved has been matched by the choice of equipment and techniques.

A typical response to four different incidents illustrates the type of decontamination equipment required and equally important how it can be used to best effect.

### ROAD TANKER ACCIDENT

The main contamination risk is from the tank contents that can range from harmless organic materials to highly toxic and corrosive chemicals. Although casualties may be exposed to the contents of the tank, it is usually the

emergency service personnel responsible for containing the spillage and clearing the scene that have most need of decontamination facilities.

For incidents of this type a medium size decontamination shelter such as the Hughes CUPOLAdacon 2 is invariably adequate for all incidents including the most serious and can be used to treat both casualties and emergency service personnel as well as small items of equipment.



*The CUPOLAdacon 2 is a versatile decontamination shelter that can be used to decontaminate emergency services personnel and their equipment, or members of the general public*



*Self contained portable atomized spray unit*

### INDUSTRIAL CHEMICAL SPILLAGE

The same type of decontamination unit can be used for incidents involving spillages and leaks of chemicals in industry, and only in major incidents such as industrial explosions should larger units be necessary. However, in some instances, detergents or other chemical additives may be required in the wash water to ensure more effective decontamination.

These can be introduced in several ways, but the simplest and most reliable technique is to use some form of chemical inducer whereby the amount of additive drawn into the water supply is directly proportional to the flow rate. A twin inducer offers the best compromise between portability and flexibility. One or two different additives can be introduced alone or in combination to suit the specific contamination hazard and the actual flow rates can be adjusted within the design parameters of the particular inducer units, the sizes of which will vary according to the concentration levels that are required.

The medium size decontamination shelter can also be used as a temporary store for leaking drums which can be

placed on the integral sump until they can be safely removed.

Disposal of the sump contents, whether wash water from showering or leaking chemicals, needs careful consideration as direct discharge into the drains could pose an environmental hazard. Pallet mounted waste receptacles with anything up to 1,000 litres capacity offer the best option as well as a convenient and safe method of storing and transporting contaminated clothing. They are usually made from heavy duty woven polypropylene and have removable side panels for rigidity. When used for storing liquids, the receptacle is fitted with a polyethylene bag which can be

filled from the decontamination shelter's waste water pump and then capped off when full while awaiting removal. Full receptacles can be easily moved with a fork truck and when not in use they can be folded flat and stacked for storage.

Alternatively, portable reservoirs which can have capacities up to 5,000 gallons can be used for temporary storage to contain wash off from showers or hazardous chemicals from leaking tanks. They are equally suitable for use as holding tanks for storing water at remote locations for wash down or fire fighting.

In view of the cost difference, portable reservoirs are considered reusable items whereas palletised receptacles can be either re-usable or disposable depending on the circumstances and the nature of the contained chemicals.

Pillow tanks have been used for many years and remain an option especially for situations where a gravity feed is used. However, as the choice of storage solutions increases, the disadvantages of the pillow tank tend to outweigh the benefits. One problem is that it is difficult to assess the level of liquid in the tank and the difficulty of handling means there is an increased risk of spillage. Gravity feed also means

that a residue of contaminated liquid is always going to be present in the feed pipe work after filling and this inevitably poses a further containment and disposal problem.

### TERRORIST SABOTAGE ATTACK

This could now include a threat from chemical, biological, radiological or nuclear contamination and is likely to involve large numbers of casualties.

Separate provisions must be made for the emergency services personnel and the public. Whilst the medium size shelters, discussed earlier, are adequate for the decontamination of the emergency services, larger multi-channel units are required for decontaminating what could be large numbers of people, both walking and stretchered. Here the emphasis is on speed and some of the latest units can process up to 300 people an hour.

They provide protection from the elements, privacy during treatment and a controlled and comfortable decontamination environment. Systems are usually mounted on pallets ready for transporting to the scene of an incident and can be fully operational in under ten minutes.

There are both inflatable and rigid framed units and they can be supplied with a range of ancillary equipment



*Twin inducers for adding detergents and other chemicals to the shower water*



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*Decontamination packs include disposable garments and footwear*

such as air and water heaters, waste collection facilities, chemical inducers, portable generators and lighting.

These decontamination shelters are fitted with a removable inner lining and partitions that can be arranged to suit different decontamination procedures. A typical five-section arrangement used for three-stage decontamination would have four sections for walking casualties and one for stretcher cases. By rearranging the internal partitions more space can be allocated to stretcher cases or, by removing them completely, the system can be used as a holding area or first-aid centre.

Alternatively, shelters can be configured to process groups of people, say ten at a time, segregated into male and female streams. Casualties first disrobe in a separate section which is either an integral part of the shelter or a separate but attached enclosure. They then move into the main decontamination area and stand in line. They are decontaminated simultaneously at separate showering positions which include overhead and chest height nozzles. On completion they move out together into a re-robing area.

Consideration also has to be given to the comfort and security of casualties in mass decontamination situations.

Pre- and post-decontamination packs should be prepared containing suitable disposable garments, footwear and hygiene items. Sealable bags should be provided so that contaminated clothing can be disposed of safely. Security sealed bags are necessary for the safe storage of valuables and these should have a unique number which corresponds with the number on an identity wrist band given to each casualty.

#### **ANTHRAX THREAT IN COMMERCIAL PREMISES**

Anthrax and similar airborne contaminants have already proved very disruptive and difficult to contend with and consequently require special methods of treatment.

The priority is to contain and neutralise the threat as quickly as possible.

Foam and mist systems are increasingly popular and both suppress the contaminant while at the same time neutralising the threat.

Foam based systems tend to be used on structural surfaces, large equipment and vehicles. They are either mounted on a trolley or in a back-pack for maximum portability and deliver a thick, sticky foam that adheres to surfaces and traps the contamination whilst neutralizing it. The foam immediately

suppresses vapour and powder to minimize the risk of dispersal. Foam bubbles have a scouring effect on contaminated surfaces, and the addition of a solvent can further improve the penetration and effectiveness of the neutralising agents.

Once decontamination is completed, the neutralised chemicals can be washed from the affected surfaces using a portable jet washer. During this final wash-off stage, there is further opportunity to add chemicals as a precautionary measure to complete the process.


In confined spaces, or where sensitive equipment is involved, an atomised spray is more effective. It quickly disperses throughout the treated area and condenses on all surfaces to provide uniform coverage. This eliminates the risk of wetting or excessive exposure associated with normal spray nozzles which could damage equipment.

A dilute neutralising agent is delivered by compressed air, fed from a standard breathing apparatus cylinder, to a hand-held ultrasonic spray head where it is atomised into a dense fog.

The same system can be used to decontaminate the inside of protective suits delivering a fine mist that disperses evenly throughout the suit to ensure uniform treatment of all internal surfaces.

Emergency services can only work with the equipment that is available to them and are therefore reliant on specialist manufacturers to deliver effective solutions. This means close co-operation between the two; emergency services feeding back front line experience and manufacturers responding with appropriate products. Leading manufacturers also explore new decontamination techniques to deal with potential threats before they materialise. Such forward thinking is a key component in ensuring that emergency services can respond effectively. It also means that the choice of decontamination solutions is constantly widening enabling emergency service personnel to select a treatment that is precisely targeted at the specific task.





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# PROCUREMENT

**ONCE AGAIN, it is fast approaching the time of year when departments from all over the world, put out tenders for new equipment. Listed below and on the next four pages is a selection of equipment and products available to assist in any procurement or specifying decision.**

## NEW MASS DECONTAMINATION SYSTEM READY FOR ACTION



A MASS decontamination system pioneered in the UK takes the very latest technology right to the incident scene.

The beauty of the Aire Group system is that it can be working in minutes, decontaminates dozens of people every hour and can be in action non-stop.

The man who invented it, Aire Group chief executive Richard Bailey, has based it on his award-winning Areshower decontamination unit technology which won the Queen's Award For Enterprise for its amazing innovation. This is now deployed all over the world.

The Areshower links to a water heater and also hooks up to Areshelta inflatable shelters so the whole decontamination process takes place undercover, no matter what the weather or where the incident has happened. Curtains inside divide men and women.

People who are contaminated are given a large towelling robe to wear so they can strip off underneath in dignity and privacy.

With around 80% of a contaminant caught on clothes, these are put in a biohazard bag to be taken away and incinerated.

The people are then given masks to stop them breathing in any contaminant, a pair of flip-flops, take off the robe and walk into the Areshower.

More than 100 litres of water gush out of the Areshower's several sprays

every minute at a constant heat of 35°C – and this can go on for weeks if necessary. The contaminated water falls through a special floor into a 800-litre capacity tank and is immediately pumped away to massive bags outside for disposal later.

The contaminated person walks under a spray with a special soap solution at first and then under clean water – and it's done in a minute. They then get dressed in paper suits and poncho rainshields.

Staffordshire Ambulance Emergency Planning Manager Len Hunt uses the system. He said: "This system's strength is its sheer flexibility. We can expand it, contract it, add more shelters if we want and take it anywhere quickly. I was in the army before joining the ambulance service and from my experience this bit of kit is certainly the way forward."

*For more information please contact*

**The Aire Group**

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[www.airegroup.co.uk](http://www.airegroup.co.uk)

## NEW LIGHTWEIGHT ERGOTECH™ RANGE OF FIREFIGHTERS CLOTHING PROVIDES GREATER ALL-ROUND COMFORT

Bristol Uniforms Ltd, the UK's leading designer and manufacturer of class leading firefighters clothing, has launched a new range of ergonomically designed lighter weight firefighters clothing to complement its two leading brands, Wessex and Jaguar.

Collaborating with its major customers in the UK, as well as feedback from overseas distributors, the Company has spent a year working with key materials suppliers in a project to bring to the market a new concept in firefighting clothing which provides improved fit, greater comfort and less weight without compromising levels of operational protection. The result is the new Ergotech™ range.

Driven in part by the current focus in the industry in both the UK and across Europe on the problems of heat stress, the Ergotech™ range is designed to help reduce the internal heat build-up from the wearer's body for extended operational performance and greater user safety by the extensive use of breathable materials.

Incorporating Nomex® and Goretex® fabrics, the new clothing features a mix of features to provide an improved fit and wearer comfort. The coat incorporates a tapered girth with a sleeve featuring a pre-bent construction and underarm gusset. Added protection and comfort are provided by closed cell foam padding to shoulders and elbows with an extended lined and laminated catch flap. The trousers also feature a pre-bent seat and knee construction for greater wearer flexibility, a lower rise at the waist (fully compliant with EN469) and incorporate Arashield knee pads with closed cell foam pad lining.

Ian Mitchell, Bristol Uniforms' joint Managing Director, highlighted the benefits of close customer relationships in bringing about new product developments commenting, "Whilst we recognise the importance of complying with all the design and manufacturing standards required to ensure performance and safety, we nevertheless have a desire to make our firefighters' clothing as comfortable as possible for the wearer". "Collaborating closely with our many customers has been at the root of our continued success and has enabled us to evolve our garment design in a way which ensures our brand-leading styles are widely respected amongst the UK's fire brigades as well as firefighters overseas".

*For more information about Bristol Uniforms or Bristol Care please contact either:*

**Roger Startin, Bristol Uniforms Ltd**  
on 0117 956 3101 or email  
[roger.startin@bristoluniforms.co.uk](mailto:roger.startin@bristoluniforms.co.uk)



# T ROUND UP

## CEOTRONICS MORE THAN JUST HEADSETS

CeoTronics is world market and technology leader as manufacturer of electronic communication systems for perfect communication, above all in difficult ambient conditions. The wide range of products for the most different applications comprises besides classic headsets and other communication systems for connection to analog and digital radios, the wide range of products for extremely different applications includes above all complete system solutions, e.g. mobile or permanently installed digital mini radio networks, which can be set up in seconds.

Dynamism, creativity and flexibility – CeoTronics has set consistent standards with these criteria – ever since the company was formed in 1985. Our high quality standards and individual customer service underline our claim to being a premier supplier. CeoTronics is thus the market leader in audio, video, and data communication, for example, for use in noisy and hazardous environments.

CeoTronics is a recognized partner of the most well known helmet manufacturers and of the leading manufacturers of digital and analog radio sets, mobile and DECT phones.

Since 1998 CeoTronics shares have been quoted on the Frankfurt stock exchange. Via its numerous subsidiary companies, branches and cooperation partners the CeoTronics group guarantees competent advisory services and front-line support in over 30 countries on five continents.

*For more information please contact:*

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## IMPROVED PROTECTION AND COMMUNICATIONS FOR FIRE-FIGHTERS

Helmet Integrated Systems Ltd. (HISL) manufactures the Cromwell range of fire-fighters helmets and communica-



tions, used by fire services in countries that include Belgium, Brunei, Denmark, Germany, Italy, Spain and Switzerland. The company's latest helmet, the Cromwell F600, is used by 26 of the UK's major fire services, including London Fire and Civil Defence Authority, the British Airports Authority and the Scottish Ambulance Service. Combined with users of the Cromwell 500 – the company's traditional wide brim helmet style – there are now over 27,000 helmets in regular use.

The Cromwell F600 is the first helmet and face shield combination to achieve dual CE certification (EN433: 1997 for the helmet and EN166: 2001 for the face shield) demonstrating proven standards of high wearer protection and enhanced comfort that have won widespread acceptance from fire fighters.

The stylish, compact, modular design of the F600 enables it to be adapted to individual operational requirements. Three versions can be selected with the option to upgrade at any time using easily replaced components: helmet only, helmet plus face shield and helmet plus face shield with face shield cover assembly.

This modular approach significantly extends service life, since damaged components are quickly substituted, without compromising performance, a significant factor in the F600's low cost of ownership.

As a further enhancement to their range of protective helmets for fire and emergency services personnel, HISL have

introduced the Cromwell Signum – a universal communications headset, designed to fit easily and quickly into Cromwell or other makes of helmet.

The headset provides high performance and reliable RX and TX with the option of a low profile bone conducting microphone or boom microphone. Positioned on the crown of the wearer's head, the bone conductive microphone ensures the optimum clarity of communications.

Lightweight and comfortable to wear, the Cromwell Signum headband connects to an intrinsically safe Press To Talk (PTT) switch and down-lead assembly, which is configurable to most radio types.

With almost 80 years experience, HISL is a world-leading designer and manufacturer of helmets for fire and emergency services, police and security forces industrial workforces, civil and military aircrews, with full BS EN ISO 9001 accreditation.

*For more information please contact*

**Helmet Integrated Systems**

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Web: [www.helmets.co.uk](http://www.helmets.co.uk)

## FIRSTCHECK . . . THE WORLD'S FIRST MULTIGAS WITH PPB PID

Ion Science is pleased to announce the launch of its new product FirstCheck, the very first multigas to combine complete VOC and toxic gas detection from ppb up to 10,000 ppm with traditional sensors for O<sub>2</sub>, H<sub>2</sub>S, CO and LEL detection. Making FirstCheck a must have instrument for first responders and confined space entrants.

FirstCheck's unique, highly sensitive photoionisation detector (PID) enables the detection of many gases, including many WMD (weapons of mass destruction) gases that are toxic at low ppb levels and are undetectable by existing multigas instruments. Traditionally two or three instruments are needed to ensure workers safety. Now FirstCheck has it all covered in one handheld detector.

Due to FirstCheck's vast detection range a wide number of hazardous and

Detectable Gases Include:	Typical Applications Include:
<ul style="list-style-type: none"> <li>• O<sub>2</sub> from 0 – 25%</li> <li>• CO from 0.1 – 1,000 ppm</li> <li>• H<sub>2</sub>S from 0.1 – 100 ppm</li> <li>• LEL from 0 – 100%</li> <li>• VOC's and other toxic gases from ppb to 10,000 ppm including: <ul style="list-style-type: none"> <li>• Ammonia</li> <li>• Some WMD's</li> <li>• Benzene</li> <li>• Ethelyne</li> <li>• Isobutanol</li> <li>• Gasoline vapors</li> <li>• Jet fuel</li> <li>• Liquefied petroleum gas</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Emergency first response (including WMD)</li> <li>• Confined space entry</li> <li>• Haz/Mat</li> <li>• Industrial</li> </ul> <p>Please search our gas table at <a href="http://www.ionscience.com">www.ionscience.com</a> for a full list of detectable gases.</p>

toxic gases can be detected in many different types of application (see table above).

FirstCheck is unique in that the user can select the best way for them to view readings to suit any given situation and personal preference. Options available are large numbers with a rotate option, a real time graph of each sensor reading, multiple bar graphs and multiple number readings both to allow the simultaneous viewing of all 5 sensor readings.

#### Key features include:

- ppb – 10,000 ppm for unrivaled detection of VOC's and toxic gases
- Large numerical back-lit display for easy viewing of readings
- Real time graph display for an instant assessment of readings
- Data download via infrared port to a PC for analysis of all 5 sensors output with easy to use software
- Health & Safety mode for STEL and TWA monitoring
- Display all 5 readings in a graphical or numerical format for simultaneous assessment
- Icon driven menu for ease of understanding
- Intrinsically safe for use in flammable areas (approvals pending)

For more information please contact us at [info@ionscience.com](mailto:info@ionscience.com) or on +44 (0) 1763 208503 quoting FC02, or visit our website [www.ionscience.com](http://www.ionscience.com).

### EXXONMOBIL OPTS FOR TYCO'S NEW ROUGH TERRAIN FIRE MONITOR

ExxonMobil has placed an order for no fewer than 35 of Tyco Fire and Security's new Macron Cobra RTV low-cost, rough terrain, four-wheel fire monitors. The fog/jet monitor was developed to meet ExxonMobil's specific needs and is designed to operate efficiently in all weather conditions and in every conceivable rough terrain environment. The



order followed a fast-track product development programme at Tyco's Fire Suppression Product's operation in Great Yarmouth and proving trials at ExxonMobil's facility in Fife, Scotland.

The new lightweight Macron Cobra RTV combines what is described as "exceptional throw characteristics" with optimum delivery of water or foam either in a solid jet or a spray pattern. Robustly constructed using mild steel for the trailer and highly durable, non-corrosive, welded stainless steel and bronze for the monitor, it weighs just 72kg. The capacity can be easily adjusted to match site conditions and deliver water at up to 3,700 litres a minute at 10bar with 360-degree rotation and elevation spanning from plus ten degrees to plus 55 degrees.

Designed by Tyco engineers for fast deployment and stability when in operation, the new Cobra RTV allows single-handed operation with easy to use controls.

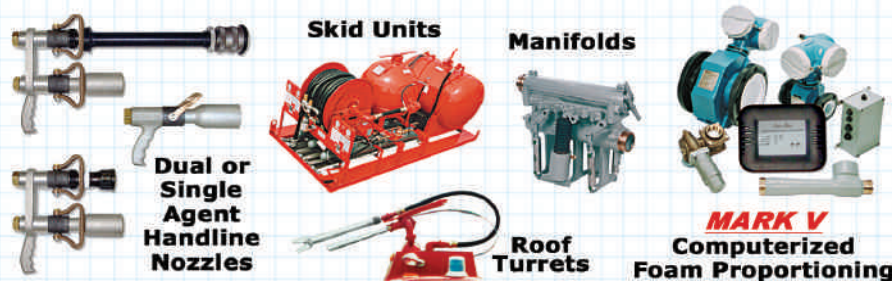
As standard, the premium-build specification includes independent swivel suspension roller bearings that are a major boost to the Cobra RTV's manoeuvrability over uneven or potholed surfaces, and manual wheel locking on the two rear wheels. The Cobra RTV also incorporates a locking monitor elevation handle, a detachable trailer handle, and twin instantaneous manifold inlets with spring-loaded non-return valves and integral check valves that allow either single or twin feed. Hose baskets on either side of the monitor can each accommodate up to 20 metres of the recommended hose, the Macron Viking layflat hose.

The Macron Cobra RTV can be factory-fitted with a number of optional features, including foam-filled tyres in place of the standard pneumatic tyres. A self-inducing model is also available, and a salt water resistant model with a stainless steel trailer body has been developed for marine applications.

Macron is a European-based fire suppressant brand, which is part of



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Tyco's Fire & Security's fire suppression business unit. The full line-up of Macron's special hazard fire protection products includes extinguishers, fire hoses and reels, foam proportioning and discharge devices, and sophisticated fire detection/suppression systems. These include Hygood gaseous and chemical clean agent extinguishing systems.

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[www.macron-safety.com](http://www.macron-safety.com)

## NEW HYDRAULIC CUTTING TOOLS FROM NIKE HYDRAULICS



*Nike Hydraulics DHS150*

Nike Hydraulics has recently launched two hydraulic Cutting tools to the market, DHS150 and DHS240. The new tools meet the demands of a high cutting capability in high-tensile steel structure, that are used when manufacturing e.g. modern

passenger cars and truck cabins etc.

The Cutting tools has been tested by the Swedish Rescue Service Agency Academy and proved to be able to "cope with the toughest task you can meet today". When testing the new hydraulic cutting tool DHS150 from Nike Hydraulics one of the objects was the new SUV, Volvo XC90.

During the test the used cutting force was measured when cutting strategic points on the Volvo XC90. At no point more than 20-75% of the maximum cutting force was used. The toughest parts were middle and lower part of B-post and lower part of C- post.



*Nike Hydraulics DHS240*

The hydraulic body from Combi tool DHK45/370, which is a success story in it self, has been used for the two hydraulic Cutting tools, DHS150 and DHS240. This hydraulic body is well-tried as it was included in five hundred Hydraulic Rescue Kits, delivered to the Swedish Rescue Services Agency, some years ago.

Since the demands of the rescue service changes over time, Nike Hydraulics has the unique possibility to modify the tool from an "ordinary" Cutting tool to a Combi tool or vice versa by just changing the blades.

The high cutting performance that has been achieved by DHS150 and DHS240 is due to the combination of an excellent hydraulic body and a developed cutting blade design.

In order to meet the demands from end users, DHS150 has a general cutting blade design as "a parrot beak shape". This means a high cutting force and an ability to force the material, intended to be cut, into an area where the cutting force reach its maximum.

The hydraulic Cutting tool DHS240 meets the demands for an all-round tool and has a general cutting blade design as "an eagle beak shape" which in turn means a long reach, in the main straight blades and extreme high cutting force in the notch.

For more information  
**Nike Hydraulics AB**  
 Tel:- +46 (0) 16 16 8200  
 Fax:- +46 (0) 16 13 9316  
[www.nikehydraulics.se](http://www.nikehydraulics.se)

## RAE SYSTEMS LAUNCHES ppbRAE PLUS, EXTENDING LEADERSHIP WITH MARKET'S MOST POWERFUL PID FOR VOC DETECTION



SUNNYVALE, Calif. – July 12, 2004 – RAE Systems Inc. (AMEX: RAE), a leading global developer and manufacturer of rapidly-

deployable, multi-sensor chemical and radiation detection monitors and networks for homeland security and industrial applications, today announced that it has launched the ppbRAE Plus, one of the most sensitive volatile organic compound gas monitors available to the market. The ppbRAE Plus can detect volatile organic compounds (VOCs) in concentrations as low as 1 part per billion, and by leveraging patented photoionization technology, the ppbRAE Plus has extended its upper detection range from 200 parts per million up to a new high scale reading of 2,000 parts per million. The ppbRAE Plus was designed for HazMat and Homeland Security applications such as the detection of toxic industrial chemicals and chemical warfare agents, and the assessment of people in decontamination settings, whether accident victims or exposed workers. Other applications include leak detection, industrial hygiene and indoor air quality surveys, where the unit can be used to identify the sources of odors and to search for mold and mildew by measuring microbial VOCs.

In addition to the expanded detection range, the ppbRAE Plus' self cleaning lamp and sensor minimize the need for maintenance and calibration and sets a new standard for resistance to the moisture and dirt common to hazardous field

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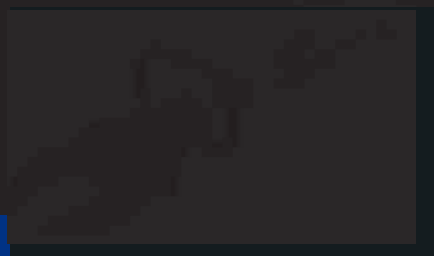


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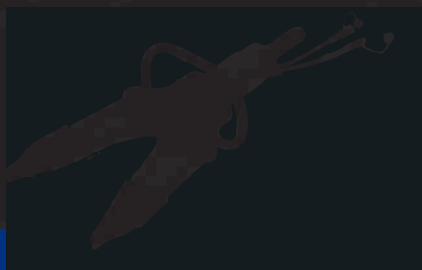
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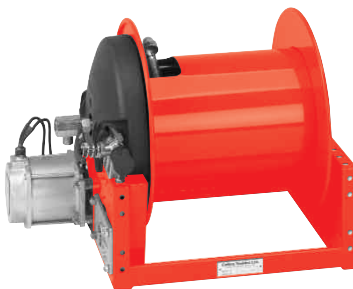
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environments. Broad spectrum detection is critical in protecting human lives, and the ppbRAE Plus has more than 100 built-in correction factors, enabling the unit to measure over 300 different VOCs. In addition, the ppbRAE Plus has UL, cUL and ATEX certifications and a lifetime warranty on non-consuming components.

"The most advanced PID detection available just got a lot more advanced," said Robert I. Chen, CEO of RAE Systems. "As the pioneer in photoionization technologies for sensing and monitoring solutions, we strive to respond to what our market tells us is important, and many sources told us that a more powerful VOC sensor was high on the list. We're confident that the ppbRAE Plus will provide powerful protection to the men and women who are working to protect us."

The ppbRAE Plus is priced starting at \$6,215 and is available now. Upgrades to existing ppbRAE units are also available.

For more information, please visit the **RAE Systems website** at [www.raesystems.com](http://www.raesystems.com) call 1-877-723-2878 or e-mail [raesales@raesystems.com](mailto:raesales@raesystems.com).

### SAFETY TORCHES – VISIBLY BETTER IN YELLOW

Wolf Safety, the only company now manufacturing yellow right-angle and straight safety torches which comply with the 94/9/EC ATEX Explosive Atmospheres Directive, is celebrating the success of its new ATEX Safety Torch range.

ATEX compliance is now mandatory for Ex. Equipment throughout the EU, but as well as meeting this requirement Wolf Safety's ATEX torches incorporate innovative features and benefits to give exceptional performance.

Instantly recognizable in yellow, the colour traditionally synonymous with safety torches, the six ATEX compliant models have proven their robustness and reliability when extensively tested by many organizations in extreme conditions.

Approval for high power alkaline cells, giving a long duration has proved a positive selling feature, as has the use of high output xenon or halogen long life bulbs giving more than twice the light output of traditional safety torches. The top of the range T4+ halogen version incorporates a unique low battery indicator which offers an immediate assessment of battery life, giving

reassurance to the user before entering hazardous areas.

The torch enclosures are very robust with proven impact and chemical resistant properties. Advanced ergonomic design of the torches facilitates single-handed switching, even with a gloved hand. The fully sealed enclosure, which incorporates the switch contacts, ensures much greater reliability of operation, especially in wet conditions.

Wolf Safety are attracting many new users who recognise the improved benefits and performance of the ATEX Safety Torch range, including fire brigades, police authorities, HM Customs & Excise, chemical processors, oil and gas producers and ocean going tanker fleets.



Wolf Safety's ATEX torches

For further details please contact the sales office at:

**Wolf Safety Lamp Co Ltd**

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Sheffield S8 0YA

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Fax: 0114 255 7988

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# DQE, Inc.

**D**QE, Inc. is one of the most experienced providers of hazardous materials decontamination training, equipment and protective gear with distributors on every continent servicing most every country around the globe. DQE divides its efforts between two distinct markets: hospitals and first responders (firefighters, Haz/Mat teams and EMS). For hospitals DQE provides training, policies & procedures, equipment and sustainment tools. For first responders, DQE provides easy-to-use equipment and decon supplies.

The company, located in Indianapolis, IN (USA), was founded in 1990 by an emergency medicine physician and a firefighter/HazMat specialist who recognized the unique role that hospitals and first responders play in disaster response and the lack of practical, efficient decon equipment in this area. They both believed there was a better way to train healthcare facilities and equip first responders.

DQE's medically-based training and equipment systems serve a range of

responders: from large urban hospitals to small rural facilities, military Haz/Mat teams to volunteer fire departments and everything in between. DQE designs and manufactures its own decontamination systems and represents internationally-recognized manufacturers of personal protective equipment and supplementary items. DQE equipment ensembles include decontamination showers, collection pools, chemical protective clothing, respirators, and a wide range of support items including water collection systems, victim care and personal decon kits like the industry-first Doff-it™ Personal Privacy Kit,



which enables Haz/Mat victims to undress in public while maintaining privacy.

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Decontamination showers are easy to use and allow for expansion and adaptability, forming a foundation of equipment required for Haz/Mat response. They are light weight, portable and require little maintenance. Showers are quick to deploy and ideal for rapid, mobile responders. Victim care products are creative in design, economical and expedite the decon process. PPE kits are simplified and prepackaged for "grab and go" utility. DQE also provides customized solutions based on specific user needs. Several of DQE's products were inspired by customer needs and DQE is always receptive to responding to the requests of responders everywhere.

Though DQE addresses the needs of hospitals and first responders with different solutions, common sense and practicality are common among them all. It is this philosophical approach that has enabled DQE to become the "voice of reason" in an industry that is otherwise riddled with conflicting and confusing information.

DQE currently distributes its products internationally via distributor-partners as well as directly to the end-user. For more information about purchasing internationally, or to find a distributor in your country, call (US) 1-800-355-4628 or visit [www.dqeready.com](http://www.dqeready.com).

For more details contact:

## **DQE, Inc.**

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Fax: +1 317-295 9822



**Industrial**







# Bristol Phys Focus on PPE He

By Roger Startin

clothing being tested.

Assessments carried out included an analysis of objective and subjective data. Objective data included core and skin temperature, heart rate and total body weight loss. The subjective evaluation included ratings of comfort and exertion. Ergonomic assessment was also obtained using an ergonomic drill which included walking, crawling, stair climbing and reaching exercises conducted over a period of around 6 minutes.

Individual experiences were recorded in questionnaires on comfort, fit, ease of donning and doffing and overall ease of movement. These responses were collected both before and after the exercise drills, the treadmill tests and after doffing the different types of ensemble.

Throughout the trials 10 Bristol fire-kit assemblies were used which were a mixture of existing and new material combinations and designs. All, however, fully conformed to the material, design and construction requirements of the provisional European Standard prEN469:2002

## TEST RESULTS

Whilst the physiological tests indicated no significant differences between the different ensembles tested (see graph below), primarily due to the large inter-individual differences in the measures, there were some highly significant differences in the subjective analysis which clearly allowed the ensembles to be ranked from 'worst' to 'best'. Sufficient consistency prevailed to allow the best 3 and worst 3 ensembles to be clearly identified.

## PRE-TEST QUESTIONNAIRE ASSESSMENTS

Prior to the trials only the one piece coverall was identified as being less than comfortable. In a statistically significant find, all 4 Ergotech™ variants scored in the top 5 for ease of donning with the 2 coveralls ranked worst. Overall the 4 Ergotech™ models were ranked in the top 4 positions.

## INTERIM ASSESSMENTS (POST ERGONOMIC DRILL)

Two of the Ergotech™ models were consistently ranked best for freedom of movement with the coveralls ranked worst.

Fabric differences played a significant

## The issues involved

With the growing interest in heat stress associated with the wearing of firefighter clothing in a variety of operational situations, Bristol Uniforms retained the services of Human Vertex Ltd, a recognized leader in the conduct of complex human trials, to set up and carry out a programme of physiological tests during the autumn of 2003.

Generally accepted as one of the most physically demanding of all civilian occupations, firefighting has been extensively researched in respect of the physical protection afforded by personal protective equipment (PPE) against various forms of hazard exposure but has not, until recently, received the same level of attention in terms of the impact and effect on the firefighter of the clothing itself.

"Concerns raised about the health and wellbeing of firefighters wearing fire coats and trousers made from layers of fabric designed to protect principally against flames, heat and water for lengthy periods of active duty have led to much debate recently about heat stress and its impact on the operational effectiveness of firefighters", comments Ian Mitchell, Joint MD at Bristol Uniforms Ltd. "At Bristol we have made a conscious decision to channel part of our research budget into this important area because without PPE suppliers committing time and resource to such issues, development and innovation of the next generation PPE will simply not happen".

Human Vertex Ltd refer to this subject as the 'detrimental effect on firefighters thermoregulatory system' and the week-long trials conducted at the University of Birmingham in October were designed to inform the debate and to become the first extensive study of its kind undertaken by a PPE manufacturer in the UK to focus specifically on this important issue.

Bristol Uniforms Ltd works closely with its trading partners and support for this project was given by W L Gore & Associates, DuPont de Nemours, A W Hainsworth Protective Fabrics, 3M UK Plc and Dufлот Industries

## THE METHODOLOGY

The trials were undertaken in the environmental chamber of the School of Sport and Exercise Sciences in October 2003 and used a modified version of the provisional European Norm prEN469:2002 Annexes D & E. The modifications became necessary when the exercise intensity proposed in the standard was found by Human Vertex Ltd to be incompatible with current accepted limits adopted by UK fire services.

Six operationally active firefighters were initially subjected to a series of baseline assessments in a thermo-neutral laboratory before undergoing 10 separate treadmill exercises in an environmentally controlled laboratory over a 4 day period. All the volunteers were deemed fit for the study by their Occupational Health Advisor.

In a further departure from the proposed core temperature monitoring method – using the 'tympanic captor' method which is considered to be a weak measure – temperature pills were used. To equilibrate to body temperature the pills were administered at least 60 minutes before trials began and replaced as required.

The study was conducted on a double-blind basis. Neither volunteers nor testers were given details of the fire



# iology Trials at Stress Issues



part in the comfort rankings exploring freedom of movement during the ergonomic drills involving Bristol's Jaguar, Wessex and Ergotech™ styles. Those incorporating newer fabric combinations using Titan/Airlock/Nomex Viscose or Isoair consistently outsourced the same models incorporating the more traditional combinations of Delta T/Fireblocker/traditional quilt for ease of movement. This was a statistically significant finding.

The 4 Ergotech™ designs were ranked in the top 5 for compatibility with other elements of PPE in ergonomic drills.

Overall 4 of the top 6 ranked ensembles were of the Ergotech™ design

## POST TEST ASSESSMENTS (AFTER DOFFING)

At this last stage of the assessment process the earlier results were largely confirmed.

Ease of doffing questionnaires confirmed all 4 Ergotech™ models in the top 6 whilst in terms of freedom of movement following the exercise period 4 of the top-ranked ensembles were Ergotech™ designs. Overall the 4 Ergotech™ models scored in the top 5 whilst the coveralls ranked worst.

In terms of the fabric combinations the Titan/Airlock structures all outsourced their traditional quilt versions.

The final overall ranking assessment after the week's testing placed the Ergotech™ clearly as the superior design and most preferred ensemble. In terms of fabric use, the 3 Titan/Airlock combinations outsourced their equivalent traditional quilt versions. In both final assessments the results were statistically significant.

## FUTURE CONSIDERATIONS

A number of important issues arise from the findings of these trials. Human Vertex Ltd have offered a number of suggestions and some of these are summarized below to help inform and stimulate discussion as to the conduct of future effective and realistic trials and the devising of appropriate standards for the measurement of the effectiveness of firefighter PPE.

"The questionnaire data obtained during this study indicates that the volunteers were able to differentiate between ensembles in terms of comfort, thermal strain and freedom of movement. However the two ratings scales that were used during the modified exertion and comfort tests proved to be too insensitive for significant results to be generated. We would therefore recommend that different scales

are used in future trials. For example a simple sweat scale might enable robust ranking data to be generated".

"It must however be remembered that the subjective scales and the questionnaires used during this trial were not required of the Standard; they were included in this trial in an attempt to make the assessment more rigorous and more informative. Annex E of Standard prEN469:2002 in its current form does not make enough allowance for the inter-individual differences in sweat rate, core temperature dynamics or heart rate response to exercise. Nor does it take account of the superior wicking properties of modern fire protective fabrics. We would recommend that a different approach is made to assessing firefighters' clothing".

"We have presented a more rigorous and reliable strategy to set the exercise intensity and have presented evidence to suggest that different pass/fail criteria are required. It might be better for example to use time as a measure of performance. One could for example measure the time taken for a volunteer's core temperature to increase by 1°C when exercising in a thermoneutral environment to determine a time-to-fail criterion. Alternatively, one could pass only those ensembles that produced a minimum core temperature increase following a given exercise duration, a criterion that has been used in the past. Using either of these strategies it would be possible to rank in order of effectiveness any number of fire-kit ensembles, providing sufficient tests were completed to allow for inter-subject differences in responses".

"In general terms the modified test used in the present study was successful for the following reasons. It took into account the fitness profile of each volunteer. The exercise intensity was calculated from oxygen uptake data, a measure that is consistent over time. Each volunteer completed the protocol without risk to their health and safety. The exercise intensity was still sufficient to identify differences in fire-kit ensembles".

## SUMMARY AND CONCLUSIONS

In summarising the results of the trials Human Vertex Ltd concluded that "this study showed that there was no significant difference between the fire-kit ensembles in terms of the physiological effects upon volunteers. They were however, significantly different in terms of comfort, fit, and fitness for purpose, i.e. their ergonomic performance differed".

"This report also shows that subject-specific, low intensity exercise performed in fire-kit can elicit sufficient changes in physiological and subjective responses to enable fire-kit ensembles to be assessed safely. It also presents an appraisal methodology that uses fire-specific drills and bias-free questionnaires that are capable of eliciting robust, statistically significant rankings of fire-kit ensembles".

"It is recognised that more work needs to be completed before robust and fair pass/fail criteria can be introduced into a modified version of Standard prEN469:2002. However the protocol described in this report could form the basis for a revised Standard".

In a concluding comment on the value of these extensive trials, Ian Mitchell added, "This research clearly shows the importance of good practical ergonomic design and an understanding of the physical demands placed on firefighters. PPE needs to work as much as possible in harmony with the firefighter".

Bristol Uniforms Ltd has developed this level of design expertise from decades of supplying Fire Services around the world and maintaining UK based technical and design skills in an era when so much industry knowledge is being outsourced or moved to low cost countries".



*INMACO staff: Back row, from left: Anders Svensen Project Manager, Jørgen Pettersen Projects/QA Manager, Morten Benjaminsen Managing Director. Front row, from left: Client: Jim Morrison QA Manager FAJV, David Morgan Mechanical Engineer Woodside Energy, David Broddle Inspector Moody International Norway*

## INMACO

### Southern Norway rules the Australian safety business

A major breakthrough says Morten Benjaminsen, Managing Director of INMACO, after the company had been awarded the contract for delivery of Firewater Deluge Skids to the Woodside Enfield Project.

FluorAmec JV the EPCI contractor responsible for all procurement on behalf of Woodside Energy selected INMACO for this package sitting a high technical quality and presentation as some of the reasons for their decision.

We were complimented on response to customer queries and together with our experienced staff was also a major factor said Morten.

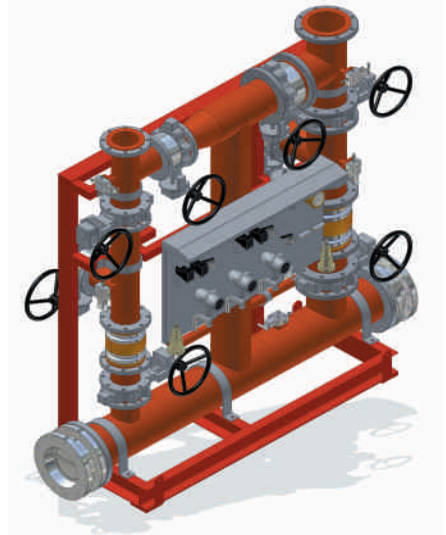
This order follows closely on the back of another contract in Australia for the supply of a Water Mist and Inergen Skid on the ConocoPhillips Bayu Undan field.

In 2003 INMACO signed an agreement with POGC Sensor Technology and with their offices throughout Australia and New Zealand opportunities are plenty full.

At the moment Australia is a very exciting prospect but we must not forget other market opportunities especially the

UK and a decision is expected shortly on a number of new contracts on which we are more than hopeful said Morten.

Established in 2002 INMACO operated as a consultancy company for the first



1050-250 Enfield Dual 14052

year but during the spring of 2003 it was decided to change direction and become an independent safety contractor and provider of safety systems to the oil and gas market. Morten went on to say that INMACO competence lies in product know how, project execution, integrated solutions, technical awareness and customer satisfaction.

Today INMACO have a staff of 9 plus a UK office all focused on international markets. Knowledge of the industry comes from in house personnel being involved in Offshore and Petrochem business since the mid eighties.

Since the Norwegian oil adventure started in the late 1960s Stavanger has been the heart of offshore activities and as it is our business to be involved in this market sector INMACO have opened an office there which will cover Norway and Scandinavia.

Through subsidiaries, affiliates and agent networking INMACO's goal is to be a global oil and gas industry provider of safety engineering, contracting, integrated solutions and high technical products.

After a successful 2003 the first half of 2004 has confirmed the need for our services and products. In order to serve the increased work load, INMACO staff has lately increased with three new members.

Thorbjørn Løvdal joined in February as Project Engineer and Designer. Thorbjørn holds an engineering degree and came from Norfoss Kidde Offshore & Marine where he worked as safety system CAD operator/designer.

Gunnar Valle joined in April as sales manager. Gunnar's safety system experience comes from his time with Firetech/Norfoss. Operation is out of Stavanger and Gunnar will look after the Scandinavian market.

Arild Lervik joined in May and will work in project management and engineering. Arild holds an Msc process engineering degree and his safety experience came from his time with Norfoss.

Through subsidiaries, affiliates and agent networking INMACO's goal is to be a global oil and gas industry provider of safety engineering- and contracting services, integrated solutions and high technology products.

We look forward to serving you!

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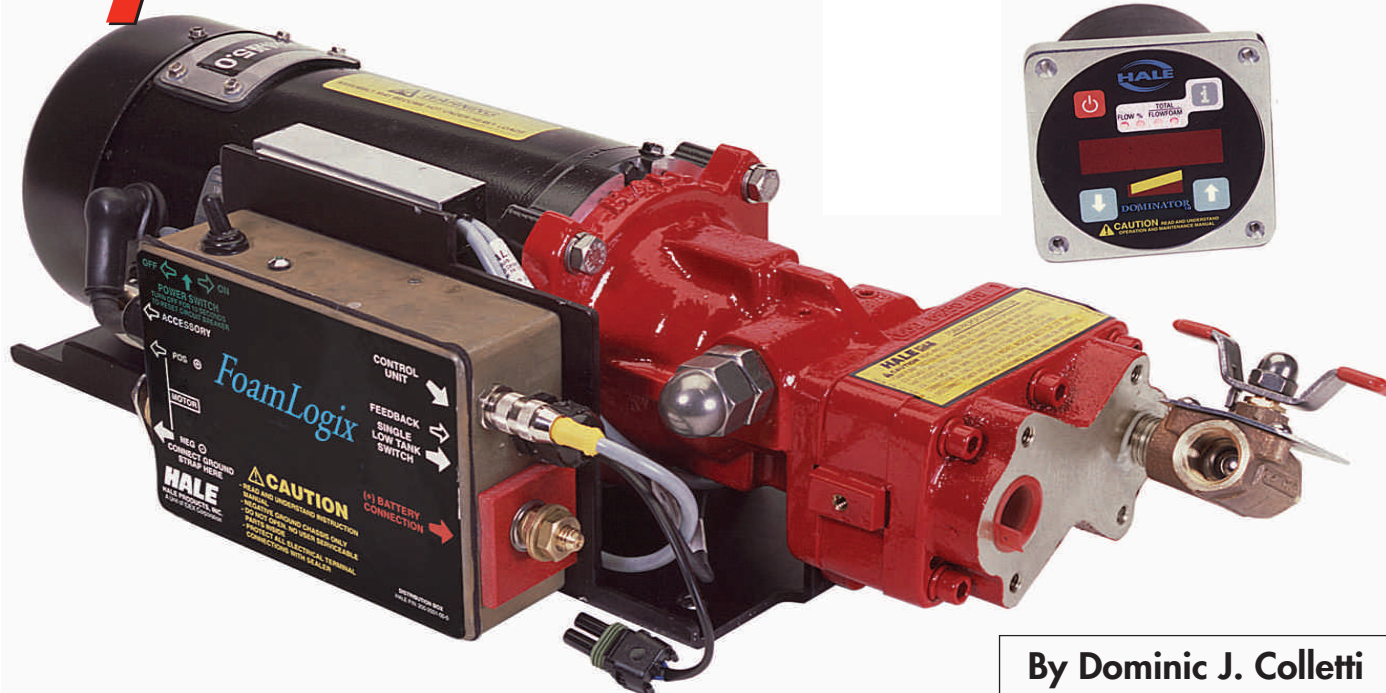
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# Specifying Foam Systems



By Dominic J. Colletti

**FIRST THE GOOD NEWS:** your department's apparatus committee has decided to install a foam system on a proposed new engine. Now the bad news: there is significant disagreement among committee members regarding which foam system to specify. The committee is hung up: should it be an eductor, around the pump, electronic direct-injection, or balanced pressure system? Should the new apparatus carry Class A, or only Class B foam concentrate? Or should it be equipped with dual foam concentrate reservoirs to carry both?

Specifying foam systems for fire apparatus is a broad topic. With all the hardware and foam agent choices on the market today, it can be a real challenge for a committee to specify a foam system that meets the community's needs, provides the biggest bang for the buck and is the best value over the life cycle of the apparatus.

Whether located in a rural, suburban or urban location, if your department will be installing a foam proportioning system on a new full-size engine, here are two major topics to review during the specification process:

## 1. Consider the benefits of Class A foam

If the new engine's mission is general duty, if it's to be used for trash, automobile interior, grass, wildland/urban interface and structure firefighting, consider adding Class A foam capability as another valuable tool. Using Class A foam to quickly extinguish ordinary combustible fire is a good practice that increases fire suppression capability and firefighter safety.

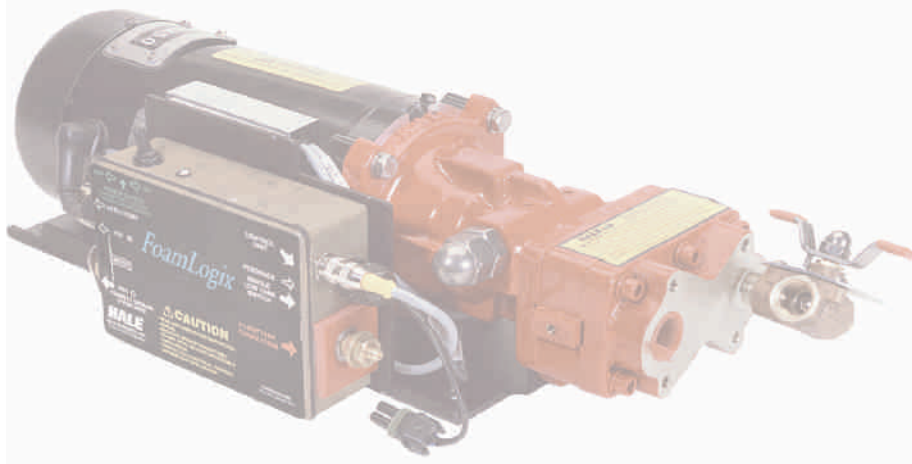
The benefit of using Class A foam can be significant — that is since in most fire districts ordinary combustibles make up the majority of working fire

responses. For example, in year 2000, NFPA reported some \$9,501,000,000 or 83% of all property damage occurred in structure fires. Half of the property loss occurred in residential properties.

Class A foam makes good economic sense from the standpoint of reducing property loss and increasing firefighter safety while combating structure fire.

The state-of-the-art foam system used with Class A foam concentrate today is the *electronic direct-injection system*. This unit siphons Class A foam concentrate from an apparatus on-board storage reservoir, typically built as an integral part of the apparatus booster tank, and injects it into piping on the discharge side of the fire pump. Foam concentrate reservoir capacities typically range from as small as 20- to as large as 40-gallons.

The advantages of an electronic direct-injection system are clear; after being turned "on," the system requires no pump operator intervention — it is fully automatic. It continually monitors



flow rate and self-adjusts to inject the proper amount of foam concentrate over a wide range of flow rates and discharge pressures. The system also prevents the fire pump, apparatus booster tank or potable hydrant water source from becoming contaminated with foam, since waterway-check valves are installed.

The typical electronic direct-injection foam proportioner can be connected to multiple fire pump discharge locations on your apparatus. With installations on new fire apparatus we normally find that two 1 $\frac{3}{4}$ -inch cross-lays, a 2 $\frac{1}{2}$ -inch side or rear discharge, and a front 1 $\frac{3}{4}$ -inch trash line have been designated as "foam capable." The remaining fire pump discharges are "water capable" only.

**2. Consider installing two foam concentrate reservoirs on your engine – one for Class A foam concentrate, and the other for a multi-purpose Class B foam concentrate, such as a 1% & 3% AFFF-ARC**

What about flammable liquid fuel spills and fire? The capability of applying a multi-purpose Class B foam concentrate is important when tackling a gasoline spill or fire at an automobile accident or vehicle extrication scene.

Since 1991, the Environmental Protection Agency (EPA) has made it a requirement that refineries use "oxygenates" – additives that reduce smog-forming tailpipe emissions – because they make gasoline burn more completely. In certain areas of the country, refineries chose to use ethanol, while in other areas refineries chose to use methyl tertiary-butyl ether (MTBE) as a gasoline additive. Extinguishing gasoline treated with MTBE is a real challenge. This is where multi-purpose aqueous film forming foam – alcohol

resistant concentrate (AFFF-ARC) comes into play. This type of foam is multi-purpose in that it will handle both a burning normal hydrocarbon fuel (diesel, kerosene, etc.) and a polar solvent fuel (alcohol, undiluted MTBE, etc.) when applied at the manufacturer's specified application rate.

On a new engine, adding a second foam reservoir to carry Class B foam and a dual tank changeover valve is a minor cost increase in the overall scheme of things that can provide a good return on investment.

Oh, did I mention that an electronic direct-injection foam-proportioner could be retrofitted to existing apparatus? You may want to immediately explore what it would take to retrofit a unit on your most highly active engine – it may cost less than what many department members believe.

When specifying a foam proportioning system, identifying the intended firefighting purpose and the types of foam concentrates that will be used (Class A and/or Class B foams) are important factors that need be considered in the planning process of any new apparatus. In today's wide world of available foam products, many

apparatus committees look beyond a proportioning system alone and often investigate and specify Compressed Air Foam Systems (CAFS) to provide an even higher level of value-added firefighting capability. What is the big fuss about CAFS and do they really provide firefighters and officers with a significant fireground competitive advantage?

CAFS provide firefighters with the capability to make quick and effective fire-stops. Typically used to generate Class A foam, CAFS generate high-quality finished-foam bubble blankets that cling well to vertical fuel surfaces encountered in wildland and structural firefighting. The high-quality finished-foam holds moisture on fuel surfaces where it either evaporates or penetrates thus cooling and lowering fuel temperature. The advantage of turning a given water-delivery rate into a compressed air foam stream is that the foam stops fire in less time, using less total water supply. CAFS reduce the total water supply required to extinguish a given size fire by as much as two-thirds, as compared to using water alone. This has several benefits that include less fire and water damage to structures and reduced exposure to heat and toxic products of combustion for firefighters, thereby reducing stress and risk of injury. Additionally, CAFS hoselines are typically filled with approximately 30% compressed air. This makes them lighter and easier to maneuver over difficult wildland terrain or to advance throughout a structure's interior. Using CAFS, initial attack resources, equipment, personnel and water supplies, have far greater fire combat capability. When apparatus committees purchase a properly designed and sized CAFS – and obtain

*On a new engine, adding a second foam reservoir to carry Class B foam and a dual tank changeover valve is a minor cost increase in the overall scheme of things that can provide a good return on investment.*



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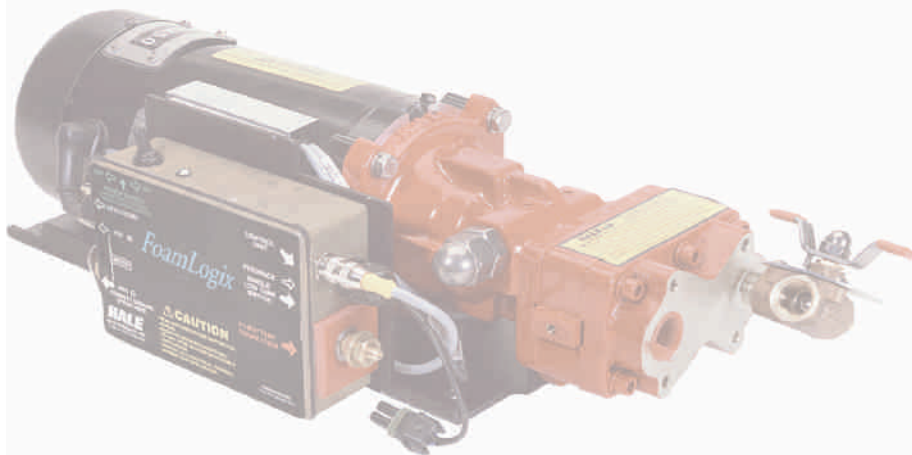
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good training on its proper use – the technology provides high levels of value to the firefighter, fire department and fire district residents.

The CAFS hardware concept is simple – it involves combining a fire pump, a foam concentrate injection system and an air compressor to produce high-quality finished-foam streams inside apparatus piping.

When looking at specifying Compressed Air Foam Systems, it is important to plan ahead and ensure that the system properly matches your departments firefighting needs. Vital is to thoroughly understand the operating characteristics and safety features of the system. This is since firefighters will now be dealing with pneumatics – the delivery of compressed air. Important to the committee is to look at system component design and review hands-on system operation, including safety features and system interlocks. These safety features should be seamless to pump operation and prevent pump operators from mistakenly delivering “air” only, or “air and water” only (without foam concentrate) through attack hose. This is critical to initial attack teams who, for example, may be positioned in a potentially deteriorating location ready to trounce a structure fire.

Typically, a full-size engine with CAFS has a rotary air compressor, around 200-SCFM (standard cubic feet per minute) in size, and an electronic foam concentrate injection system with a 5-gpm capacity. Stated simply, CAFS produce foam streams by supplying water from the fire pump into a manifold where foam concentrate is injected. Compressed air is then injected into foam solution. Compressed Air Foam is then produced inside the apparatus piping and transported to fixed monitors and/or through attack hose to portable monitors and handheld nozzles.

Reviewing departments’ apparatus who have recently purchased CAFS, we find that many of their full size engines have the following CAFS capable discharges installed: two 1¼ inch cross-lays, one side or rear 2½ inch discharge and one 3-inch pre-piped deck gun.

In lieu of installing the above mentioned pre-piped fixed monitor, many departments recently are choosing to install a pre-connected 2½-inch attack hose with portable monitor. This provides a high-flow hard-hitting foam application appliance that’s portable and easily repositioned to suit ongoing and changing firefighting needs.

When specifying CAFS, there are a variety of items that must be kept in

mind by the apparatus committee. At the top of the list is “easy operation.” Easy operation translates into “low maintenance” for the training officer who’s responsible to see that all pump operators are trained to proficiently and instantly generate the required foam consistency – wet, fluid or dry – safely, every time.

The CAFSPro® system, by Hale Products, Inc., uses a 210-SCFM air compressor and the state-of-the-art FoamLogix® electronic foam concentrate injection system to provide the ultimate in Compressed Air Foam control. Designed to operate with flows from 30 to 1000 gpm, and over a 75 to 150 psi range, CAFSPro takes care of foam generation by a design that takes the system control burden off the pump operator. Hale performed extensive “human-factor” engineering to produce CAFSPro. Human-factor engineering consists of making sure that a system is easy to operate, user-friendly, and when a pump operator makes a “mistake,” as forgiving as possible. For example, CAFSPro design has removed up to 6 operation steps that were required to produce Compressed Air Foam found in earlier generation compressed air foam systems. This is a tremendous advantage when, at 2:00 am on a Saturday morning, a pump operator who was suddenly awake in quarters must operate the unit under the stress of a severe working fire. Good system engineering and ease of use is critical to dependable operation and takes considerable stress away from the situation while also removing opportunities for pump operator mistakes.

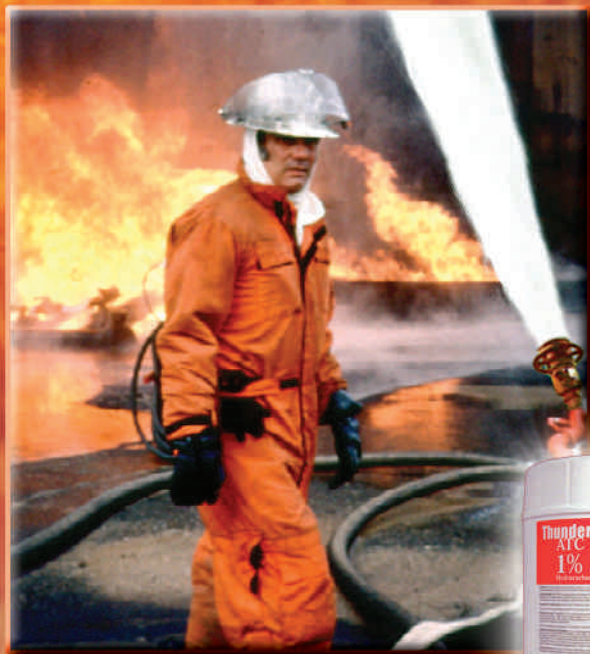
Hale Products has just released a new CAFSPro video that shows easy operation and explains the system’s features and benefits. It also shows a CAFSPro demo where a fully involved wood frame dwelling was knocked-down in seven seconds, using 14-gallons of water. To obtain a free copy of the video and other CAFSPro information, please contact me at: [dcolletti@idexcorp.com](mailto:dcolletti@idexcorp.com)

*When looking at specifying Compressed Air Foam Systems, it is important to plan ahead and ensure that the system properly matches your departments firefighting needs.*

Dominic Colletti is the Assistant Chief of the Humane Fire Company in Royersford, Pennsylvania, and the Global Foam Systems Product Manager for Hale Products, Inc. Dominic can be reached at: [dcolletti@idexcorp.com](mailto:dcolletti@idexcorp.com)



# TWO PIONEERS. ONE FOAM.



Dwight lives in the South, Mitch to the North. Dwight circles the globe battling fires that engulf fuel storage tanks and oil fields. Mitch travels too, but mainly to visit laboratories and test facilities. Dwight Williams owns and operates Williams Fire & Hazard Control. Mitch Hubert is the senior chemist at the Ansul Fire Technology Center.

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One day, Dwight asked Mitch to invent a foam that was better than any on the market. Plus, Dwight was to test it personally. So Mitch rolled up his sleeves and developed a product he knew would satisfy Dwight's high expectations. Dwight then tested it under conditions far exceeding normal approval agency requirements. Today, Mitch's foam is the most potent weapon in Dwight's firefighting arsenal.

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# VEHICLES

**Selecting the right vehicle has never been an easy process. The manufacturers and their products listed on the next couple of pages should help when specifying your departments most valuable asset.**

## ALBERT ZIEGLER GMBH & CO. KG



The Germany based ALBERT ZIEGLER GmbH & Co. KG, being one of the leading companies in the fire industry, was founded in 1891. ZIEGLER has continuously developed modern equipment which is required by the fire services. The excellent quality of all ZIEGLER products is documented according to DIN EN ISO 9001 Quality by TÜV Cert.

ZIEGLER's range of products:

- **Fire vehicles for municipalities, industry, airports, forest fire fighting**
- **Fire pumps, portable and vehicle mounted ones**
- **Fire hoses**
- **Hose maintenance equipment**
- **Fire fighting equipment**

Research and development cover future needs, the design is based on many years of experience, a highly qualified staff and solid craftsmanship guarantee high quality and long life-time of our products. Adaptability to special requirements as well as a permanent dialogue with the users secure practical and economical problem solutions.

ZIEGLER have set up a network of

agencies and partner companies all over the world, thus guaranteeing the capability of a worldwide after sales service by authorized mechanics who get their training from ZIEGLER regularly.

In the past few years ZIEGLER have put more focus on special airport fire fighting appliances, industrial vehicles, and on vehicles for municipal fire departments, taking into account that electronical controls have been introduced by most of the leading chassis manufacturers. To be able to communicate with the controls of the fire pack ZIEGLER have introduced CAN-Bus technology in their vehicles including the complete control of all vehicle functions from coloured monitors, both in the driver's cab and in the pump bay or even at the roof turret. Automated processes avoid malfunctions and the operator gets clear messages in case of errors. A lot of safety features are focussed on the crew cab to provide safe transport and ergonomic storage of the equipment eases the work of the fire fighters as much as possible, so that they can fully concentrate on their job of rescuing or fighting fires.

*For more information contact:*  
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 Fax: +49 7322 951 2 11  
[www.ziegler.de](http://www.ziegler.de)  
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## E-ONE FIRE AND RESCUE VEHICLES CAN BE FOUND WORLDWIDE

When fire departments and brigades around the world need custom fire and

rescue trucks, they often turn to E-ONE to meet their needs. E-ONE offers a full line of pumpers, aerials, rescues, and special service vehicles designed to handle a wide range of municipal, industrial, and airport applications.

All of E-ONE's custom cabs are built of high-strength aluminum with a reinforced structural cage and thick walls to protect the occupants against impact. Their bodies are made of interlocking aluminum extrusions welded to aluminum plates to produce a vehicle that is strong, lightweight, and extremely corrosion-resistant.

For municipal customers, E-ONE offers pumpers with a choice of cabs, pumps, and engine locations to maximize cab room, increase compartment space, and improve maneuverability. Aerials include ladders and platforms in several lengths and styles to improve reach and allow setup in congested areas. Special service vehicles include heavy rescues, hazardous materials units, command and communications centers, and many others.

Industrial customers select E-ONE pumpers and aerials for their ability to deliver large volumes of various specialized suppression agents. Pumpers are available with high-output pumps and high-capacity water and foam tanks. Aerials include heavy-duty ladders and platforms capable of delivering high-volume elevated master streams. A variety of monitors can deliver long-range streams of water, foam, or encapsulated dry chemicals.

E-ONE's ARFF vehicles have tank capacities to handle the largest aircraft. Their Titan HPR vehicles are powered with high horsepower engines for maximum acceleration and they feature independent suspensions for faster off-road speeds and better cornering stability.



# ROUND UP

The new E-ONE articulating boom with an exclusive penetrating nozzle allows fast, accurate delivery of agents into an aircraft interior from any angle.

Over the years, E-ONE has worked hard to establish their reputation as a worldwide leader and they are proud of all their fire and rescue vehicles. That's why they can say that E-ONE is simply "The Best Truck."

For more information contact

**Emergency One Inc**

Tel:- +1 352 237 1122

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Web:- [www.e-one.com](http://www.e-one.com)

## NEW CONCEPT RESCUE VEHICLE



At the Safety – Security 2004 in Finland Plastisol will show a completely new concept of a rescue vehicle. The vehicle is built on a MB 416 cdi Sprinter chassis.

The vehicle is very well suited for use in congested areas or inner cities with narrow streets, where regular fire fighting vehicles have difficulty driving through.

The new Plastisol concept is approx. 200 cm wide, which enables smaller turning circles and faster approach.

The vehicle is equipped with a 600 litre integrated tank and a OneSeven® extinguishing system with a power of well over 4000 litre. The fully integrated crew cabin offers space to 4 people, and can easily be upgraded to 6 people. This vehicle concept can also be supplied on other types of chassis.



Because of the long life cycle of the GRP material it is also possible to place the body on another (new) chassis in a later stage. The layout of the separate material compartment is built to customer specification. This way this vehicle can serve many purposes: fire fighting vehicle, rescue vehicle, diving truck, personnel/material truck or ambulance.

This big surprise of this new concept is that the net volume is larger than a standard locker truck, allowing for a large range of materials to be transported in a relatively small vehicle, which offers many advantages.

For many years now Fire Brigades have chosen GRP superstructures and cabs. The GRP is corrosion proof and maintenance-free. The Plastisol GRP is also shock-absorbing and easy to repair in case of damages. Experience teaches us that in congested areas the chance of damage is relatively high, so these easy repairs may – unfortunately – be required frequently.

For more information contact:

**Plastisol B.V.**

Contact: Rob Walraven

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Molenveld 5

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Tel: +31.485.476161

Fax: +31.485.476147

[info@plastisol.com](mailto:info@plastisol.com)

[www.plastisol.com](http://www.plastisol.com)

## ROSENBAUER INTERNATIONAL

### Chassis

#### Type:

MAN 35.403 VFC/LT/46C06/ 8x4/4

#### Engine output:

294 kW bei 2000 min<sup>-1</sup>

### Cab

#### Cab design:

Series cab

#### Crew:

1 + 2

### Superstructure

- Superstructure material: Tubular steel skeleton, aluminium panelled
- Auxiliary steel frame

### Extinguishing agents

#### Foam tank capacity/material:

10,000 litres, GFP



Foam Fire Fighter SLF 10.000 Mixmatic

### Pump unit

#### Pump type and location:

ROSENBAUER ND-Pumpe Type N40, Heckeinbau

#### Drive:

Vehicle PTO

#### Pump output:

6,500 lpm at 10 bar

### Foam proportioning system

#### Type, model:

Automatic ROSENBAUER MIXMATIC balanced pressure foam proportioning system with separate HATZ diesel motor for the foam pump; electronic pump pressure regulation and differential pressure adjustment

#### Admixing rates:

Individual selection between 0, 3 and 6% on each of the pressure outlets. Selection between 0, 3, 6 and 8% on the roof monitor

## TELESCOPIC CRANE

- Rescue cage hydraulically extendible to a working height of up to 22 m, incl. ROSENBAUER RM25E extinguishing monitor (2,000 lpm) 6 outriggers
- Maximum cage load 360 kg, slewable by 360° Driven by separate vehicle PTO; all control functions can be carried out either from the rescue basket or by using the 10 m cable remote control

## Roof monitor

### Model:

Electrically controlled RM25E

### Output:

Up to 2,500 lpm at 10 bar

Monitor equipment:

Foam barrel, monitor searchlight, deflector

## Rapid response hose reel unit

### Type:

1 NP rapid response reel

### Length of hose:

30 m non-collapsible rubber hose

### Type of branch pipe/output:

ROSENBAUER NEPIRO with foam attachment, 200 lpm at 10 bar

## Technical data

### Operational weight:

Approx. 33,000 kg

### L x B x H:

10.66 x 2.5 x 3.75 m

## Special Features

- External supply connection for 24V, 230V and compressed air
- Self-protection system across the entire cab and superstructure roof (sprinkler system against radiant heat build-ups during prolonged missions)
- Frame cable winch: Rotzler Treibmatic TR030, tractive force 50 kN, available cable length approx. 58 m, draw-out to front

For more information contact  
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[www.rosenbauer.com](http://www.rosenbauer.com)

## SEAGRAVE INTRODUCES CONCORDE CHASSIS FOR FIRE AND EMERGENCY SERVICE

## Concorde Cab – Room for Everything

The new Concorde all-aluminum cab is available in three cab lengths: 54-inch, 60-inch and 72-inch (center axle to back of cab). It is also available in three roof heights:

- the flat roof provides 59-inches of headroom



Seagrave Concorde

- the 8-inch mid-roof provides 67 inches
- the 14-inch raised roof option soars to 73 inches, providing firefighters of average height plenty of room to stand up, move about and dress comfortably.

A sturdy door construction is intended to withstand punishing daily use, and its 34-inch clear, open width provides easy entry and exit. The Concorde features a two-step, stair-type entry with a 20-inch loaded step height. The lower step is serrated, expanded metal which is self-cleaning and non-slip. The upper step is embossed diamond plate to prevent slippage.

The roomy cab interior is 88 inches wide, affording ample shoulder room and space between the seats. Seating configuration is standard with driver, officer and two rear facing seats, and offers an option for 1-4 forward-facing crew seats on the backwall, for a maximum of 8 seats. The cab measures a spacious 36 inches from the tunnel to the rear wall in the 60-inch cab, and 48 inches in the 72-inch cab, providing the most leg room in its class. H.O. Bostrom and Seats, Inc. ABTS (All Belts to Seat) seats are available in various styles as standard, with a wide variety of seat options, including SCBA and electric seats.

The Concorde is available with Caterpillar C-9, C-11 and C-13 engines, and Cummins ISM and ISL engines, up to 525 horsepower. The cooling package to support these new engines includes a new engine-mounted serpentine radiator/charge-air-cooler, with mounting to afford a tighter fan tip clearance. To provide maximum efficiency and durability, serpentine polyvee belts with auto-tensioners and a high-efficiency 30-inch, 9-blade engine cooling fan are included. A Horton DriveMaster fan clutch is standard for quieter operation

and a more efficient cooling package. A newly-designed Donaldson single-stage air filter is included, which is more compact and features a replaceable element with a 200,000 mile life to reduce maintenance costs.

The Concorde is standard with a Class 1 Smart Programmable Switch Panel which features ergonomic rubber molded rocker-style switches that can be used as off/on or programmed with two functions per switch. Available as an option, the Class 1 Command Master is a complete pump panel control solution which includes engine information and diagnostics, pump information and diagnostics, and master pressure gauges. It is available as an option in the cab, on the pump panel, and at the ladder tip/platform.

## Great Lengths to Design the Best

"As Seagrave designed this new truck, dozens of customers, scores of vendors, and hundreds of employees and dealer personnel were involved" said Jim Hebe Seagrave CEO. "The Concorde was an undertaking that swept up people and great talents that surrounded it. Seagrave literally was galvanized to go to great lengths to outdo itself. We were focused on building the best platform possible, and then we researched and applied the best possible truck technology in the world. The technologies in the Concorde are the result of this extensive effort, and we believe we've delivered the best, most productive result for the fire service industry."

Seagrave Fire Apparatus, founded in 1881, is the oldest continuous manufacturer of fire apparatus in North America. The company employs 422 through its manufacturing facilities in the U.S. and Canada. Seagrave products are distributed and serviced by a dealer network with locations throughout the U.S. and Canada. The firm's comprehensive range of custom apparatus includes aerials, aerial platforms, tractor-drawn aerials, pumpers, and rescue units. All Seagrave products are NFPA, DOT and FMVSS compliant. For more information, visit the Seagrave website at [www.seagrave.com](http://www.seagrave.com)

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Pic courtesy of Akron Brass

# Deck monitors to state of

- THE USE OF FIXED DECK MONITORS dates back to the beginnings of the earliest horse-drawn fire engines where a hose with a smooth bore nozzle was crudely fixed to the fire engine. Today's modern fixed deck monitors take several forms and offer several options, which were not available just a few generations ago.

## FIXED DECK MONITORS

The earliest monitors consisted of a split waterway design leading to a 'T' joint to which the nozzle was attached. The original monitors had limited movement and relied on the fire-fighting vehicle being positioned correctly at the fire scene so the stream could be directed accordingly. This quickly progressed to monitors being able to offer 360 degree horizontal and varying degrees of vertical control. Control of these axes were either by a friction lock or by a gear allowing the firefighter to direct the water stream then lock the monitor in the new position. Typically the flanges were 2" or 2½" 4 bolt ANSI 150 lb.; however, other sizes were available in addition to having the inlet of the pipe threaded to accommodate a NPT thread which is still the case today.

Today's monitors tend toward single waterway Deck Monitors with flows up to 1250 GPM and 2000 GPM offering 360 degree horizontal and 150 degree or more vertical travel. Both tiller bar and gear con-

trols are offered depending on the application and space available for control of the monitor. Most manufactures offer Pyrolite (anodized aluminum) or brass monitors depending on the application specified.

One hybrid of the fixed monitor is the use of a lift-off portion of a portable monitor in conjunction with a fixed flange. This feature offers the best of both worlds for the fire service today (see *Portable Monitors*). The ground base for the portable monitor can be safely stowed in a compartment until required, whereas the lift-off portion remains securely fastened on the deck of the fire truck ready to be used as a fixed monitor. Other developments in recent years have seen the introduction of a manually installed pipe to extend the height of the deck monitor enabling it to clear any obstacle on the deck of the vehicle and to offer easier operation for the firefighter. A further enhancement to this feature is a deck monitor with a built-in elevation feature to increase the height of the deck monitor. This is accomplished by the fire-

fighter engaging a safety mechanism, which allows the firefighter to extend the height of the monitor without the need for any extra plumbing to clear any obstructions on the deck of the vehicle. Some manufactures offer an electrical version of this feature complete with remote controls.

## REMOTE CONTROLLED DECK MONITORS

The late '50s and early '60s saw the development of the first remote controlled deck monitors. These were basically manual deck monitors that had electric motors installed in place of the gear mechanisms and have to be maintained on a regular basis. The flow rates of these monitors were similar to those for manual fixed monitors. The Remote Controlled Deck Monitors of today offer a wide variety of options for today's firefighter and can achieve flows greater than 2000 GPM. Vertical and horizontal controls have been joined by features such as stow and deploy, automatic elevating capabilities, obstacle avoidance programming, limited oscillation and a wide variety of control packages from toggle control boxes to sophisticated joystick and tether controls. Electrical Self-Elevating Monitors are also a new feature in recent years, eliminating the need for special plumbing below the vehicle deck. Elevation of the monitor is controlled by the pump operator from the console in the vehicle or a control at the pump panel allowing the operator better visibility of the water stream from the elevated deck monitor. Another option, in recent years, is a control package incorporating an electric valve the operator can control from the control box for the monitor without having to purchase separate controls.

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# s – from basic of the art

## PORTABLE MONITORS

As long as fixed deck monitors have been in the fire service, firefighters have looked for a way to get the fire-fighting vehicle as close to the incident as possible to use the fixed deck monitor effectively. This is often a significant safety concern for both the vehicle and the firefighter. But with portable monitors, the firefighter had a product he could attack the fire and safely throw large volumes of water on the fire.

Today's modern portable monitors have their beginnings in the early '20s. By the '30s several companies had developed one, two, three, and four inlet Multiversal portable monitors. These products were normally manufactured from brass and offered to the fire service in polished bronze or plated finishes. Their heavy construction and the number of hoses connected to the portable monitors of the time ensured stability of the product when operating. In general, the monitors of that period were heavy, bulky, and difficult to set up and seldom utilized.

By the mid to late '50s brass portable monitors started giving way to the newer lightweight portable monitors made from Pyrolite (anodized aluminum). This gave the firefighter a newer lightweight portable monitor to combat the fire. The significant weight reduction and the vastly improved designs gave the firefighter a portable monitor that was quicker and easier to set-up. The improved designs led to greater flows and reaches enabling the firefighter to attack the fire more aggressively than before. The monitors of today come in two basic configurations. Dual Inlet Monitors with 2½" (sometimes 3" or 3½") inlets with independent clappers to allow the use of a single hose, and Single Inlet Monitors with 4" or 5" inlets, offered in either with threads or Storz inlets. Most manufacturers offer a variety of inlet and outlet thread types to accommodate varying requirements from the international marketplace, including BSP, BIM and Storz. These monitors have flows ranging between 800 and 1250 GPM, and all manufacturers offer a full range of master stream nozzles and discharge tips for varying firefighting applications.

Some of today's portable monitors offer the added benefit of being used as both a portable and fixed deck monitor on firefighting vehicles. The upper waterway (or lift off portion) of the monitor is secured to the ground base by a locking mechanism (different manufacturers have locking methods unique to their own product), which can be



Pic courtesy of Akron Brass

## Custom Technical Safety solutions

### Fire protection systems

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INMACO work with Safety and Loss Prevention Engineering Services and as Safety Contractors.

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disengaged by the firefighter. The lift off portion can be handed down from the deck of the fire truck and securely attached to the ground base for portable mode applications and more aggressive ground attacks. While in the deck mode the monitor is operated as a fixed deck monitor and can be rotated in the horizontal axis by the firefighter 360 degrees and can offer vertical angles from 35 to 90 degrees. When the monitor is in the portable mode, the scope of movement is lessened due to reaction forces encountered when in the ground configuration. Horizontal movement is limited to the manufacturer's design. However, the wider the angle of the horizontal movement the better, as it would require less repositioning of the portable monitor. Ideally a portable monitor should be able to achieve 180 degrees of horizontal travel for maximum effect. Built-in horizontal safety stops offers the firefighter added safety, as they would prevent the firefighter from over rotating the monitor in the horizontal axis,



*Pic courtesy of Akron Brass*

which could cause the monitor to become unstable. For the vertical travel, a safety stop set at 35 degrees will prevent the firefighter from lowering the elevation of the stream below a safe angle, which could cause severe reaction forces making the monitor unstable. The safety stop should only be used when the monitor is in the fixed deck position on the fire truck to travel below 35 degrees to the monitor's lowest elevation angle. The monitor's portable ground base should also include ground spikes on each leg of the base to assist in the stability of the portable monitor while in the ground mode and being used on a variety of surfaces. The ground spikes should be self-adjusting to accommodate uneven ground surfaces, and should be repairable and replaceable as required. A safety chain and hook is also recommended to anchor the monitor to street grating or a suitable fixture to offer additional stability in the event of a pressure surge in the hose lay.

Currently, the new "wave" of portable monitors are the quick attack monitors. These monitors are lighter and more compact and have a maximum flow of 500gpm. Normally these compact monitors have a single 2½" or 3" inlet with a 2½" outlet. With the 2½" outlet, the fire department can use their existing master stream nozzles and deluge tips or they can purchase one of the new quick attack nozzles.

Due to their compact size, one of the major benefits of the quick attack monitors is that they can be pre-connected and stored in the hose bed for quick deployment at the fire scene. This allows the firefighter to get larger flows of water on the fire quickly.

All quick attack monitors have a built in shut-off valve, giving the firefighter the ability to reposition the monitor without shutting down the line at the pump. Because of the ease of repositioning, a greater horizontal travel is not required. Due to the shorter horizontal travel, the monitor can be manufactured lighter and more compact and still offer the stability required by the fire service today.

For additional stability, each manufacturer designed in a distinct innovative safety feature, this gave the manufacturer the ability to increase the vertical travel with a lower angle. With this lower angle, these monitors were able to be used in hallways and other diverse applications where a low trajectory is needed.

Probably the most significant advantage of the quick attack monitor is the multi-axis outlet joint. This unique design allows the firefighter to move the stream in any direction. It is not limited to just a vertical and horizontal movement, it is also capable of moving diagonal or in a circular fashion with a smooth motion. This multi-axis outlet allows the firefighter the ability to position the stream quicker and easier. The quick attack monitors are the next generation of portable monitors that help re-innovate the way we fight fires.

In conclusion, today's fire service has numerous options to choose from covering a wide range of specifications and of course a variety of price levels have to be factored in to any purchase equation.

## Train with the Experts.



### The Hands-on Training Specialists

Offering one of the finest emergency response programs and training facilities in the world, the University of Nevada, Reno Fire Science Academy (FSA) includes a 426-acre, state-of-the-art campus in Carlin, Nevada, as well as specialized instructional programs — conducted at the academy or customized and offered anywhere in the world.

[fireacademy.unr.edu](http://fireacademy.unr.edu)

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University of Nevada, Reno

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Phone: (775) 754-6003 or  
1-800-233-8928

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# Fire and Rescue Training







# Lancashire Fire and Rescue Service Washington Hall International



## Innovators in specialist training to meet the requirements of modern emergency services

LANCASHIRE FIRE AND RESCUE SERVICE INTERNATIONAL TRAINING AND DEVELOPMENT CENTRE at Washington Hall (UK) is recognised by its customers in both the public and private sector as a centre for excellence and innovation, meeting the training needs of a wide variety of organisations. On average the centre provides 20,000 student training days each year.

Washington Hall has been a highly successful training and development centre since 1964. It boasts exceptional facilities at its 11 hectare site, attracting customers worldwide to a vast range of courses spanning key areas including Basic Recruit, International, Industrial Firefighter, Firefighter Development, Emergency Management Simulation, Fire Safety, Health and Safety and Management Development.

The training courses are widely accredited, with the Offshore Petroleum Industries Organisation (OPITO), the Institution of Fire Engineers (IFE) and

the National Examination Board in Occupational Safety and Health (NEBOSH) being examples of the accrediting bodies involved.

The Centre remains flexible to its clients' needs, whether this means providing programmes on Centre or using its expertise to create training and development solutions on site in-country.

Their global presence includes established relationships in the Middle East and in countries such as Malaysia, India, Libya, South Africa, Ghana, Nigeria, South America, Sierra Leone, Senegal, Jamaica, Trinidad, Cayman Islands, Guatemala and Kosovo. As a result,

Washington Hall has already provided training for their fire officers, mainly in the oil, gas, petrochemical and pharmaceutical industries. Trainers have developed expertise in dealing with fire and rescue situations in onshore oil and gas installations, plus recent innovations in emergency rescue and pre-hospital/first responder care for trauma victims.

Clients in the Middle East include Rasgas and Qatar Petroleum, with those in the UK including many of the Fire and Rescue Services, British Nuclear Fuels, Astra Zeneca, Pedigree Masterfoods, British Energy Generation and Dupont. These are just a few of the organisations who continue to enjoy the support they require for professional training.

### TRAINING COURSES AND PROGRAMMES

All trainers are highly qualified, possessing a wealth of experience gained working with a number of organisations to provide bespoke training courses in many parts of the world. These include Iran, Iraq, Saudi Arabia, Libya, Oman, Qatar, UAE and Jordan.

In many cases trainers are educated to degree level, having completed the Certificate in Education. The blend of operationally experienced fire service personnel and outside specialists, results in an excellent quality of training provision.

### INTERNATIONAL FIREFIGHTERS

Vast experience has taught Washington Hall that providing high quality training to international students requires a special understanding of individual requirements. Training is offered on centre or in-country, with courses tailored to meet each organisation's particular needs. Although this customisation is seen as important, training is still provided with a course content designed with outcomes which are measured against UK standards and competence.

Many courses attract internationally recognised qualifications from awarding bodies such as IOSH, NEBOSH, OPITO, JOIFF, ILM and ICET.

Although the Centre stress that international training is bespoke, the following give an example of the courses on offer:



# Fire and Rescue Service Training and Development Centre

- International Firefighter Courses
- Emergency Preparedness Training (EPT)
- OPITO 4½ day Offshore Team Member
- STCW 95 + MCA 4 day Advanced Marine Firefighting
- 5 day Team Leader
- Breathing Apparatus Courses
- MVAI and LGVI
- International Crew and Watch Management
- Compartment Fire Behaviour Training
- (Systematic Trauma and Rescue Training) START
- PPV Instructor
- International Management Development Courses
- International Fire Safety and Health and Safety Courses

## EMERGENCY PREPAREDNESS TRAINING (EPT)

Increasing public concern in the UK and the rest of Europe and indeed across the world following a number of major industrial disasters led to more stringent control over planning for hazard contingencies. Disasters in recent times around the world have made many organisations take a closer look at their responsibility to ensure that both their people and business is protected against such disasters.

As the way we live becomes more complex there is an increasing awareness of the social and economic costs of disaster and the expectations of all concerned for there to be an effective response mechanism in place.

Any uncertain event or emergency requires a fast and effective response to deal with the consequences and prevent future problems. To be effective any response must be planned in advance and cannot be left to chance hoping it will be 'all right on the night'. Therefore, organisations need to be prepared and rehearsed; having a contingency plan that is simple, flexible in nature and capable of a speedy response. The main consideration in developing plans is to base these on the response to the incident and not the cause.

Planning is also generally undertaken for a combination of reasons that might include:



- to protect people;
- to protect the environment;
- to control the actions of others;
- to protect the organisation;
- to fulfil a legal requirement;
- to create a comprehensive document;
- to prepare for unusual circumstances;
- to ensure delivery of pre-planned responses; and
- to formulate an aide memoir/checklist of actions.

## Planning Framework

In the UK integrated emergency management approach to emergency planning was adopted following the lessons learned from the Lockerbie disaster.

*'The Council (Dumfries and Galloway) should recognise in their strategic policies for emergency planning the concepts of a unified Local Authority approach, total support and co-operation, delegation of responsibilities to senior management; the dedicated team approach, and full involvement of the community in its own recovery'*

Lockerbie – A Local Authority Response (N.McIntosh, 1989, p99)

There are a number of general principles in building a 'planning framework' some of these are as follows:

- **Format** – Plans should be flexible. Include all necessary database, with contact points for key agencies, call-out responsibilities and provision of resources.

- **Implementation** – Plans could be designed on a 'menu' basis, through which identified needs could easily be matched to known existing resources.
- **Staffing** – A core team of officials could be identified as an emergency planning and response team.
- **Liaison** – Each member of the team should have clear defined roles and lines of communication.
- **Training** – All personnel should be trained, that includes strategic, tactical and operational levels.
- **Development** – Plans will be required to be developed over time and reviewed and updated regularly. Trials and exercises should be held to test the effectiveness of the plans, and those who will be involved in their implementation.

Lancashire Fire & Rescue Service Washington Hall Training Centre has linked up with one of the UK's respected experts in the field of Emergency Preparedness Training, SembCorp Utilities (UK) Ltd. Bringing together these teams will allow us to support organisations in the UK and world wide in their efforts to ensure that the plans (and execution of the plans), and training can be provided by expert quality personnel from both organisations.

## TRAUMA AND RESCUE

The Trauma and Rescue (T&R) project commenced in June 2002. The need to provide a programme that will meet the



needs of the Fire Service and commercial requirements has resulted in the trauma package START (Systematic Trauma and Rescue Management). This offers the option of training brigade instructors to deliver the twelve hour package to their personnel.

A significant amount of effort has been made to establish professional credibility through accreditation with professional bodies such as the Royal College of Anaesthetists and with links through organisations such as the Ministry of Defence, other Fire Services plus local and regional Ambulance Services.

## The Product

The courses currently offered are:

- START – Fire Service Trauma Trainer, followed by 1 week hospital training
- START – Non Fire Service 4 day trauma course
- Trauma – Annual update
- START – Licence
- Scene Safety – 2 days for doctors/nurses working pre-hospital
- UKFSSART Medic – 1 week

## Product Links

Trauma and Rescue Training has tangible links with other courses provided by the Centre, such as:

- Emergency Preparedness Training
- Commercial Firefighter Courses
- Moving Vehicle Accident Courses

## The Market

Trauma and Rescue Training is particularly relevant to organisations with medical or firefighting teams or any first responders. The following are examples of some business sectors Washington Hall currently work with:

- Fire Service
- Ministry of Defence
- Chemical Industry
- Pharmaceuticals

- Petrochemical
- Oil and Gas
- Nuclear Industry
- Sports Stadia
- Shopping Centres
- Security
- COMAH sites
- Airports
- Port Authorities
- Shipping Lines

## COMMERCIAL/INDUSTRIAL FIREFIGHTING

Washington Hall's professional Commercial Trainers are renowned for their expertise and extensive knowledge of Industrial and Commercial Firefighting. Excellent fireground facilities have permitted the delivery of this specialist training to recognised accredited standards. Major companies both in the UK and internationally have benefited, such as those in the marine, petrochemical, oil and pharmaceutical industries. On the other hand, a flexible approach means that when appropriate, training in the workplace can be undertaken to minimise disruption to the working day.

Courses currently offered are:

- OPITO 4½ day Offshore Team Member
- OPITO 2 day Team Member Refresher
- STCW 95 + MCA 3 day Basic Marine Firefighting
- STCW 95 + MCA 4 day Advanced Marine Firefighting with Command and Control
- 2 day Marine Firefighter Refresher
- 1, 2 and 3 day HOT Fire Training
- 5 day Team Leader
- Industrial Firefighter Stage 1
- 1 and 2 day Damage Repair
- Fire Behaviour Training
- 1 day LPG Awareness
- 2 day Confined Entry
- JOIFF Accredited Courses
- 2 day Hazardous Materials (HAZMATS)

## FIRE SAFETY

Companies and organisations around the world are required more and more to equip their employees with a sound knowledge of health and safety regulations and standards. Washington Hall provides a full range of suitable courses.

Fire Safety Courses are available to international students, most recently Washington Hall has provided Fire Safety Inspectors training for Nigerian Aviation Authority and Nigerian Port Authority personnel. The course reflected Nigerian legislation and working conditions, demonstrating the dynamic approach to formulating individual and international programmes at Washington Hall.

Introduction to the workplace and manual handling courses are ideal for all companies, but specialised courses providing greater skills are also available where required. The NEBOSH General Certificate and IOSH Managing and Working Safely are examples of such courses. Other safety courses include Community Fire Safety, Fire Investigation and Fire Education, all of which can be designed for the needs of the individual organisation.

Courses currently offered are:

- ½ day Fire Warden Refresher
- 2 day Fire Warden
- IOSH Managing Safely
- National General Certificate in Occupational Safety and Health (NEBOSH)
- Fire Investigation 1
- Fire Investigation 2
- 1 day Manual Handling
- IOSH Working Safely
- 2 day Risk Assessment

## FACILITIES

The line drawing of Washington Hall indicates the layout of the Centre and





each number relates to the facilities as follows:

- 1 Training area** including a variety of simulators such as the Rig, providing training for chemical incidents. Other firefighting scenarios are facilitated by the use of the Ship and Railway Line simulators.
- 2 Fireground 1** is home to LPG and Hydrocarbon firefighting training simulators.
- 3 Gallery 4** provides students with multi-level firefighting. This simulator also has carbonaceous units for Breathing Apparatus training.
- 4 Fireground 2** plays host to multi-level LPG and hydrocarbon firefighting. This training area simulates chemical spills. In addition this fireground also has an aircraft simulator and high pressure gas releases, enabling teams and team-leaders to experience a realistic incident involving fire or chemical/gas situations.

In close proximity to this fireground is a further fire behaviour simulator, the Backdraft Unit. Students are able to undertake prevention measures and practice defensive firefighting techniques.

- 5 The Silo and Rope Rescue training areas** provide specialist agricultural and industrial rescue operations, utilising specialist rope rescue techniques.
- 6 Gallery 2** is a 2-storey unit used for firefighting and damage repair.
- 7 The Flashover Unit** allows students to observe flashover, undertake prevention measures and practice defensive firefighting techniques.
- 8 Fire Safety props** including the Chippan Demo and Extinguisher Run simulators, allow students to gain practical 'hands-on' experience and theoretical instructional technique.
- 9 Gallery 1** was developed to train students in confined space scenarios including sewer rescue and tunnelling operations, while being able to create realistic rescue conditions such as intense heat and minimal to zero vision.

#### **10 Accommodation blocks**

Washington Hall boasts over 100 comfortable rooms in 3 accommodation buildings, comprising of ensuite rooms including a television and tea and coffee making facilities. The rooms are ideal for study of course materials, as they are spacious and include study desks.

A prayer rooms is also available to students.

There are also rooms with access and facilities for people with disabilities.

- 11 Lancaster House** is where courses are constantly reviewed and developed



in order to ensure the currency and appropriateness of course content and structure.

Lancaster House also has 2 well equipped lecture theatres, a flexible teaching room, an Information Technology suite and a large gymnasium, ideal for student assessments both written and practical.

- 12 'Washington Hall'** is home to a variety of training areas such as conference facilities and interactive teaching rooms.

'Washington Hall' is also equipped with a large theatre style hall, Sports Hall and Multi-gymnasium. There is also a bar with satellite television, snooker and pool.

- 13 Many and varying RTA scenarios** can be recreated on this simulation area allowing firefighters to be trained in extrication and trauma care, within realistic and dynamic emergency situations.

- 14 The Breathing Apparatus (BA) School** facilitates classroom teaching by providing realistic conditions for students to be able to appreciate heat build-up, heat and humidity, heat barriers plus heat and smoke travel.

- 15 The Firehouse** is a purpose built training simulator capable of creating varying realistic fire scenarios including domestic, commercial and hospital premises to name a few examples.

- 16 The Drill Ground** is where Firefighting recruits are put through their paces during the 13-week course, and where the newly trained firefighters demonstrate their skills at the Passing Out Parade.

- 17 The Emergency Management Simulator** allows students to be trained and assessed in a learning environment where the complexity, 'chaos' and

challenge of real incidents are created. The aim of the simulator is to provide experiences of Incident Management within a training setting, rapidly transferable to the real world.

- 18 The Training and Development Department** is concerned with strategic training and planning.

In order to meet customer needs, Lancashire Fire and Rescue Service, Washington Hall are committed to having an innovative and progressive approach, maintaining a strategic overview of new training initiatives to ensure course content remains both relevant and accurately targeted. The Centre is committed to customer care and this means tracking current and future training requirements.

*For further information please contact:*

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Continuing with customer service development, we at Washington Hall would welcome any comments you may have about the information contained within this article. Please email our Client Liaison Officer [lynnrigby@lancfirerescue.org.uk](mailto:lynnrigby@lancfirerescue.org.uk). Please quote reference IFF1 in any communication.



USAR training for Taiwan

# INTERNATIONAL CENTRE FOR EMERGENCY TECHNIQUES (ICET)

The International Centre for Emergency Techniques (ICET) is a specialist of world renown in the development of multi-disciplinary rescue training and consultancy programmes. ICET created the Systematic Approach to Victim Entrapment Rescue, SAVER™. This method is a truly interactive and universal approach to this demanding form of rescue.

ICET's consultancy department has assisted numerous local and national governments, as well NGO's in developing programmes to establish, support and upgrade emergency response networks. Under its RENU™ programme ICET has worked in countries as diverse as India, Argentina, Russian Federation, Belgium, the Netherlands and Turkey.

ICET recently has been contracted by the Gujarat State Disaster Management Authority (GSDMA) to implement the planning for Emergency Operation Centres (EOC's). The objective of this assignment is to implement a study for establishing EOC's in Gujarat and in turn to determine the requirements in each of such centres in order to provide more effective and timely response to disasters.

GSDMA was formed in February 2001 as a mechanism to manage the reconstruction

and rehabilitation programme that followed the earthquake of 26th January 2001. However, it is the intention of the State Government to ensure that the GSDMA, over time, builds long-term capabilities in disaster management and the development of those capabilities should begin in parallel with the reconstruction and rehabilitation programme. The GSDMA will provide the strong institutional base for the disaster management activities of the State. Statutory and regulatory changes will be initiated to enhance the GSDMA's capacity to deal with disasters in coordination with other agencies and the NGOs. GSDMA was awarded with a UN prize for the best DM Agency in the World in 2003.

The establishment of emergency response centres will form an important component of all disaster management programmes in the State. The centres will provide the capability to respond effectively to immediate needs following disaster, as well as important inputs to overall preparedness, and will be a significant measure of the success of the State in addressing the problems posed by disasters. The setting up of the disaster response centres will lead to quick, effective and quality response so that the loss of lives



due to disasters can be minimized.

Government of India has received a credit from the International Development Association (IDA) towards the cost of Gujarat Emergency Earthquake Reconstruction Project (GEERP). GSDMA has invited proposals to provide Consulting Services for the Establishment EOC's. ICET was selected for its multi disciplinary international background, it's experience in India and Gujarat specifically as well as its philosophy on EOC's.

Recently, the SAVER Foundation incorporated the SAVER approach for further research and development. Emergency Medicine Prof. Dr. Marc Sabbe (Leuven, Belgium) is Chairman of the Foundation.

Today, ICET is an international provider of technical assistance and training and the international representative of SAVER. In the United Kingdom SAVER training is provided by the Fire Service Training Centre of the Lancashire Fire and Rescue Service. In 2003, SAVER released a CD Rom of the basic SAVER course and on line examination. The English version of the CD Rom is expected to be released in May of this year. It can already be ordered at a pre-registration price of €48.50 less 20% at [info@savertraining.org](mailto:info@savertraining.org).

ICET most recently introduced training course is called 'Command and Coordination for incident commanders'. During this course both virtual (Diabolo VR) and realistic scenarios are used to present the participant with a variety of leadership challenges. The course was recently taken by senior officers from the Malaysians Fire and Rescue Department, with international fire and rescue veteran Joe Bishop, one of the ground layers of the INSARAG guidelines, as a course director. For more information please visit ICET at [www.icet.nl](http://www.icet.nl).

For more details contact:

**ICET**

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# Aircraft Rescue Fire



Picture courtesy of Kidde Fire Trainers

THE AIRPORTS AROUND THE WORLD are being used more intensively and the people are becoming more and more conscious about their safety. As the risks associated with this development increase, so too does the importance of effective disaster relief. The principal objective of the Airport Rescue and Firefighting Service is to save lives in the event of an aircraft accident or incident. Exercises are crucial in this. Fire is widely considered to be one of the most dangerous risks and therefore there is an acknowledged need for realistic fire training. The International Civil Aviation Organisation (ICAO) recognises that knowledge and training are fundamental elements in fire safety management and planning. Realistic training is a key element in giving people the necessary skills to manage risk and develop a safer working environment.

There is also increasing concern over the environmental impacts arising from pollutants emitted by aircraft engine exhausts. Kerosene is the main component of aviation fuel, which is used to provide propulsion for current commercial aircraft. Like other fossil fuels, kerosene produces carbon dioxide and water vapour as the products of complete combustion. The pollutants of concern are the emissions

of nitrogen oxides, carbon monoxide, hydrocarbons and soot. Emissions limits from aircraft engine exhausts have been defined for these pollutants by the International Civil Aviation Organisation (ICAO).

The innovation and the development of aircraft live-fire training simulators meet the growing need for realistic training of the emergency services and act in response to the rising environ-

mental concerns pressure at the airports. There are only a few companies in the world that offer this type of training equipment for airports. Although not yet commonplace, aircraft fire training simulators are now in place at major airports in the UK, Germany, The Netherlands, Scandinavia, Canada, USA, Japan, Hong Kong and Singapore.

The market leader in the provision of aircraft fire trainers is the UK-based company Kidde, which has an international presence through its numerous subsidiaries (Symtron in the USA and Germany, ICS in the UK and Canada and which are now known as Kidde Fire Trainers. The company specialises in designing and manufacturing fire-training simulators for a broad range of international market segments, from Fire and Rescue Departments, International Airports, through to Special Forces. Its simulators enable clients



# Training Simulators

to meet increasing regulatory and legislative requirements and are used on many different levels, helping to train professional emergency personnel through to employees within industry and commerce. With over 400 installations worldwide and with over 30 international patents, Kidde's technology meets the demand for fire fighting in the most real and challenging of situations. Virtually any aircraft crisis including all aspects of Incident, Command and Control can be created simply and safely at the touch of a button. Kidde's Civil Aircraft Simulators are designed to suit any size or category of airport.

All fire simulators operate by combining propane and water, so allowing complying with the Environmental Protection Act 1990. Kidde is the only company in the world with the capability to design and manufacture the largest aircraft fire trainer mock-up, a Boeing 747.

The largest aircraft-training simulator in the world is at Schiphol International Airport. The rig dimensions are . . .

**Length:** 52.6 metres

**Wingspan:** 29.7 metres

**Height:** 14 metres

**Weight:** 250 tonnes

This is the world's most advanced aircraft accident simulator that has been installed at Schiphol Airport, Amsterdam by Kidde to provide state-of-the-art training for airport fire crews. Kidde has developed a full-size mock-up of a Boeing 747. The detailed interior and exterior of the 747 Simulator can create an impressive 26 different fire scenarios including a high tail engine fire, broken wing and engine fires, LPG fuel spill. The simulator is fitted with a high engine to represent



Picture courtesy of Kidde Fire Trainers

an MD-11. This simulator can successfully recreate any situation that Airport fire fighters may encounter. All fires are fueled by LPG Propane, a safe and environmentally acceptable alternative to conventional carbonaceous or hydrocarbon fuels.

Fuel spills areas are located either side of the aircraft fuselage and cover an impressive 864m<sup>2</sup> and are capable of reaching a height of 10 metres! The

fuel spill area is driveable, allowing fire-fighters to position vehicles correctly, thereby experiencing the full realism of an emergency situation.

The Control Room monitors each exercise, from galley oven fire to large-scale engine fire. Located on the Training Ground, the Control Room uses the latest in PLC system software giving instructors control over training exercises.

*Kidde has developed a full-size mock-up of a Boeing 747. The detailed interior and exterior of the 747 Simulator can create an impressive 26 different fire scenarios including a high tail engine fire, broken wing and engine fires, LPG fuel spill.*



Picture courtesy of Kidde Fire Trainers

**Benefits to Schiphol** – a spokesman for Schiphol Airport explained the benefits of the rig are:

**1. STANDARDISATION:** all fire crews tackled incidents properly before we had the rig but in their own way; now techniques are harmonised through discussion amongst the teams – we have for example developed exercise duties and great progress is being made.

**2. EFFICIENCIES:** because we previously had to spend a lot of time in

preparation we can now spend a lot more of our time in actual training; previously it could have been as much as 2 to 3 months between exercises. Debriefing is so much more effective and is helping to develop future professionalism.

**3. RECORDS:** these help us understand previous experience and plan further development.

**4. MORALE:** we actually enjoy training on this rig; good positive feedback helps build morale and confidence!

**5. ICC (INCIDENT COMMAND AND CONTROL):** Exercise design helps us arrange incidents with other incident response partners and this develops overall ICC skills.

**6. ENVIRONMENTAL:** Kidde's design is a considerable improvement as previously Kerosene was set alight all over the fire ground surface.

Other smaller companies with the ability to manufacture aircraft fire trainers include the UK-based companies Simulation and Process Combustion Ltd, the Canadian Pro-Safe Fire Training Inc.

Simulation has already seen some remarkable successes, including hot fire civil aircraft simulators for Birmingham International Airport, East Midlands Airport and Bournemouth International Airport and a multi-purpose military aircraft simulator for the Ministry of Defence (MoD); the latter believed to be the largest hot fire training simulator within the MoD.

Simulation is unique in Britain in both designing and manufacturing in-house. Simulation offer turnkey projects from inception through design, development, construction, installation and commissioning. They also provide after

**INTERNATIONAL CENTRE for EMERGENCY TECHNIQUES**



**ICET: FOR THE GLOBAL ADVANCEMENT AND DISTRIBUTION OF RESCUE KNOWLEDGE AND TECHNOLOGY**

The International Centre for Emergency Techniques (ICET) is a specialist of world renown in the development of multi-disciplinary rescue training and consultancy programmes. ICET is the developer of the international SAVER standard (Systematic Approach to Victim Entrapment Rescue) and proudly presents:

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Interested parties in the U.K. can contact:

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 E-Mail: info@icet.nl  
 Http: www.icet.nl





*One of Simulations biggest contracts was for a Boeing 767 to be installed at Copenhagen Airport. The simulator was manufactured at their manufacturing facility in Burton upon Trent, England*

sales service, including planned preventative maintenance, for its own and for other manufacturers' equipment.

Simulation rigs are built with robust steel shells and internal chambers designed to simulate conditions within an aircraft, with, for example, bulkheads, seating, galleys, toilets and including hatches and emergency exits for search and rescue exercises.

One of Simulations biggest contracts was for a Boeing 767 to be installed at Copenhagen Airport. The simulator

was manufactured at their manufacturing facility in Burton upon Trent, England. The rig was then transported by ship to Copenhagen. Simulation direct employees then traveled to Copenhagen Airport to install and commission the facility. Steve Fahey, Managing Director, states "This is a very important project for us. It has strengthened our position in the international area and provides us with a high quality product reference point in Scandinavia. It was a particularly

demanding project in view of the timetable, but we are pleased that we have been able to achieve all of the targets set by our client, particularly time and cost." In the International Airport arena Simulation were awarded the contract to provide a Boeing 767 Fire Training Simulator to Airport Fire Service at Copenhagen Airport in Denmark. The contract was awarded by Copenhagen Airport in early September 2002. The contract involves the supply of a Boeing 767 Aircraft simulator with a total of 16 external pressure fed kerosene fires located around the engines, undercarriages, under wing, fuselage and nose wheel. The simulator was delivered to meet a very fast track programme and commissioning took place on the 20 December 2002.

Airport personnel face ever-increasing challenges in today's world. Fire-fighters know they may be called to respond to aircraft accidents and situations resulting from terrorist activities. Realistic training gives people the tools to react to a crisis in the correct manner and ultimately to save lives.

## Kidde Fire Trainers

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**ICS** International Code  
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Symtron Systems Inc., Symtron GmbH, ICS International Code Services, and IFTE International Fire Training Equipment Ltd. are excited to announce that they are now part of the Kidde group.

For more information, contact Kidde Fire Trainers today:

[www.kiddeft.com](http://www.kiddeft.com)

UK: +44 (0) 1246 242700 US: +1 201-794-0200

Germany: +49 (0) 241.18058.11





# TASK FORCE TIPS, Inc.

It's an accepted fact, that most departments in this country are not blessed with access to a pressurized municipal water supply for their fire suppression efforts. It's also commonly accepted, that effective rural water delivery is a combination of art, science, and a whole lot of practice.

Though terms like drafting, dry hydrants, porta-tanks, and tanker shuttles may be foreign to many urban and suburban departments, a rural agency's ability to provide high fire flows requires a thorough understanding of these key components.

## Drafting Operation Fast-Facts

- A fire pump's rated delivery capacity is based on a 150psi pump discharge pressure. At a 200psi discharge pressure the pump will provide only 70% and at 250psi discharge pressure performance will be limited to only 50% of the pump's rated capacity.

- 1000gpm, 1250gpm, and 1500gpm pumps are rated for a maximum drafting lift of 10ft. Less lift and you will have a higher potential flow capacity, and more than 10ft. lift, less capacity.
- To achieve maximum flows with 1000, 1250, and 1500 gpm pumps, a 6" hard suction line should be used for maximum drafting performance. To increase flow capabilities, two suction lines can be used at once.
- Often, the low level strainer used during drafting operations in porta-tanks will restrict your flow dramatically. Inspect your drafting equipment to make sure you are getting maximum performance.
- Using multiple porta-tanks with jet-siphons in between to transfer water, allows tankers to off-load at the pump and quickly head out to refill. In a tanker relay, maximum water delivery relies on reducing the time a tanker is

sitting. An effective tanker should be dumping, driving, or refilling.

- Back filling the hard suction line with water from the tank before starting the drafting process often reduces the time to secure a draft as well as saving wear and tear on the primer pump and motor.
- Often, turbulence and bubbles created by water being dumped by tankers into a porta-tank can be drawn into the suction hose causing a loss of prime. Within your porta-tank, try to keep your dump location as possible away from your pick up location.
- A good pump operator will keep as a priority the complete refilling of the pumper's water tank. If the tanker shuttle fails to keep up with demand, the operator can switch back to tank water allowing inside crews time to safely back out.

The new TFT BIV – Ball Intake Valve, is designed with all of these critical drafting operations in mind. The patented stainless steel quarter ball configuration is ideal for making that all-important “*tank water to drafting*” transition. The visual valve position indicator helps the pump operator make a smooth changeover, reducing the potential of losing the prime. A unique swiveling inlet allows incoming hoses to be positioned at any angle giving the driver incredible flexibility in apparatus placement, and hose movement between porta-tanks. Finally, the new BIV provides maximum flow performance with minimal loss and is designed for years of rugged durability as it includes TFT's unique polymer ring coupling attachment method as well as a unique triple coating process.

To learn more about the Task Force Tips, Inc. full line of high flow, large diameter hose hardware, ask for the new “LDH hardware” video.

For more details contact:

## Task Force Tips, Inc.

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Valparaiso,  
Indiana  
46383

Tel: +1 219 548 4000

Website: [www.tft.com](http://www.tft.com)



# TRAINING CENTRES ROUND UP

## CIVIL DEFENCE ACADEMY – SINGAPORE



*Trainees maneuvering a casualty through the confines of the 'Tunnel' simulator*

### Background

The Civil Defence Academy (CDA) opened on 26 March 1999 with the mission to equip Singaporeans and officers of the Singapore Civil Defence Force (SCDF) with knowledge and skills to protect and save lives and property. In recent years this scope has also expanded to provide quality civil defence training for overseas participants.

### International Urban Search and Rescue Course (IUSARC)

CDA conducts several international courses each year. Standing out as one of the most popular courses is the International Urban Search and Rescue Course (IUSARC). The 1st IUSARC was held in 1999 and today the course is in its 18th run, having reached out to approximately 340 participants hailing 40 countries worldwide.



The IUSARC is designed for emergency responders in urban settings and those who deal with USAR-related disaster management. The course objectives includes being conversant with the concepts and principles of USAR, and to be able to execute rescue operations

proficiently, especially in handling the equipment for such operations. The content of the two-week residential course covers Advanced Rescue Casualty Management, Debris Tunneling, Confined Space Operation and High Angle Rescue Techniques, among others.

The key thrust of the IUSARC in achieving its objectives lies in realistic scenarios and simulations that allow trainees to have hands-on application of the principles and concepts taught. The scenarios mainly revolve around three custom-built facilities located at CDA's field-training area.

The centerpiece is a collapsed-rubble structure aptly called the 'Ruins'. Measuring approximately 25m by 25m, it is equipped with a basement and voids for trainees to penetrate to extricate 'victims'. The 'Tunnel', on the other hand, is a single enclosed passage that leads to a network of rooms with pathways obstructed by concrete slabs that trainees need to break apart. The 'Houdini' is an upright duct system that challenges the vertical-rescue capabilities of the trainees in very confined environments.

*If you wish to find out more about the course, and other programmes that are available, please feel free to contact the Academy's Corporate Affairs Branch*

Tel: +65-6-794-5502  
Fax: +65-6-794-5591  
or direct your emails to  
SCDF\_CDA@scdf.gov.sg

## EMERGENCY RESPONSE TRAINING, A WORKPLACE NECESSITY



Employers, building owners and managers must provide a safe working environment for employees by law and training staff for emergency situations is an important part of this legal obligation.

Emergency Response Training teaches staff to respond to all kinds of emergencies. For example fire, explosions, gas leaks, floods, earthquakes and bomb threats, equipping employers and employees with skills that can save lives and reduce damage to property.

As a world leader in fire and safety systems, Wormald's Fire Safety Training department has provided comprehensive and professional training to clients across Australia within the aviation, health-care,

education, corporate and government sectors for more than seven years.

Specific training covering both fire extinguisher and evacuation procedure training is now being required by some Councils and Insurance Companies, making it an integral part of workplace safety and most of Australian States have some form of regulations that require employers to provide evacuation procedures for their employees.

Wormald's National Training Manager, Rod Rolfe said "The key influence in a hazardous situation is the human response to it. The impact of a crisis can be substantially reduced when people are trained to respond to the crisis correctly."

Wormald's Fire Safety Training policy, is to have a single dedicated trainer appointed to each client/organisation in order to develop a close working relationship with that client/organisation. "Our training methods and procedure manuals are customised to suit each organisation's requirements and we strive to stay close to our clients before, during and after training."

Wormald's Fire Safety Training department provides a range of training programs including Evacuation Procedure Training, Fire Extinguisher Training, both Nationally Accredited and Non Accredited Courses.

*For more information, please contact:*

**Nicki Walsh**  
Tyco Services Fire & Safety  
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Australia  
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E-mail: nickiwalsh@tycoint.com

## THE FIRE SAFETY ENGINEERING COLLEGE

The Fire Safety Engineering College, situated in Muscat, Sultanate of Oman offers a comprehensive range of Fire, Safety, Well Engineering and Facilities Management courses, unique to the Middle East.

The College provides a mix of vocational and academic programs, leading to the award of certificates, diplomas and degrees. Practical training is conducted on an extensive fire ground utilising a fleet of modern pumping appliances and ancillary equipment.

Accredited by the University of Central Lancashire, England, the College currently offers pathways to three BSC degrees:

- **Fire Safety Engineering**
- **Well Engineering**
- **Facilities Management**

The College is approved by the Ministry of Higher Education, Oman to deliver these courses to University Diploma level. The final year(s) are conducted at the University of Central Lancashire, England. At present, the College has 400 full time students enrolled in these programs and a further twenty or so undertaking courses on a part time basis. The next semester which commences in September 2004, will see student numbers increase to 600.

The Ministries in Oman provide sponsorship for around 200 secondary school leavers, attending The College; the remainder are from the Government sector and industrial clients from around 19 countries across the GCC, North Africa, India and the Middle East in general.

In the field of vocational training, The College offers around 100 short and mid-duration courses, ranging from basic firefighting to command & management. All courses are internationally accredited and make best use of NFPA & British standards. The College was recently accredited by the International Fire Service Accreditation Congress (USA) to deliver Firefighter 1 & 2 to NFPA standards. The College is the only organisation in the Middle East with this accreditation.

Aviation Fire training courses play a major role in the College curriculum. The College has two 6 X 6 and one 4 X 4 Carmichael crash rescue trucks that the students are able to use to realistic effect to attack fires on the comprehensive aviation training simulators, comprising of a full size aircraft, military jet and helicopter. Training is conducted to ICAO standards and is accredited by the UK Civil Aviation Authority International Services Department.

The College has recently joined forces with Safety Solutions UK Ltd to establish the Centre for Safety Excellence, offering a comprehensive range of Health, Safety & Environmental Courses. All courses are accredited to international standards.

The College is continually seeking to expand its product range to appeal to a wider range of clients and countries. Enquiries are welcome from anywhere in the world and should be addressed to:

**Mr. John Whitehead**  
Sales, Marketing & Business  
Development Manager  
P O Box 2511, PC 111  
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Sultanate of Oman  
Tel: +968 521077 or +968 521256  
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E-mail: johnw@fsecoman.com  
Website: www.fsecoman.com

## ICET



### International Centre for Emergency Techniques

The International Centre for Emergency techniques (ICET) is a specialist of world renown in the development of multi-disciplinary rescue training and consultancy programmes. ICET created the Systematic Approach to Victim Entrapment Rescue, SAVER™. This method is a truly interactive and universal approach to this demanding form of rescue.

ICET's consultancy department has assisted numerous local and national Governments as well NGO's in developing programmes to establish, support and upgrade emergency response networks. Under its RENU™ programme ICET has worked in countries as diverse as India, Argentina, Russian Federation, Belgium, the Netherlands and Turkey.

Recently, the SAVER Foundation incorporated the SAVER approach for further research and development. Emergency Medicine Prof. Dr. Marc Sabbe (Brussels) is Chairman of the Foundation.

Today, ICET is an international provider of technical assistance and training and the international representative of SAVER. In the United Kingdom, SAVER training is provided by the Fire Service Training Centre of the Lancashire Fire and Rescue Service. In 2003, SAVER released a CD Rom of the basic SAVER course and on line examination. The English version of the CD Rom was released in May of this year.

ICET most recently introduced training course is called "Command and Coordination for incident commanders". During this course both virtual (Diabolo VR) and realistic scenarios are used to present the participant with a variety of leadership challenges. The course was recently taken by senior officers from the Malaysians Fire and Rescue Department, with international fire and rescue veteran Joe Bishop, one of the ground

layers of the INSARAG guidelines, as a course director.

*For more information, please contact*  
**ICET**

International Centre for Emergency  
Techniques  
P.O. box 430, 4940 AK Raamsdonksveer  
The Netherlands  
Tel: + 31 (0) 162 51 70 80  
Fax: + 31 (0) 162 51 65 60  
E-mail: info@savertraining.org.  
Website: www.icet.nl.

## REFINERY TERMINAL FIRE COMPANY

### EMERGENCY RESPONSE SERVICES TRAINING ACADEMY SERVICES IN-PLANT SERVICES/CONSULTATION SERVICES



*A modern training facility to meet the  
dynamic training requirements of today's  
refining and petrochemical industry*

The Refinery Terminal Fire Company (RTFC) was established in 1948 and is a Texas Non-profit Corporation. The Fire Company operates as a "Cooperative" providing emergency response and training for its refining and petrochemical membership.

RTFC through the unique concept of ownership by its members provides state-of-the-art fire protection, prevention, inspection, hazard mitigation and technical support services. The objective of the RTFC Training Academy is to organize, maintain and operate a specialized academy to provide experience and training in fire protection and emergency response. Let us build a curriculum tailored to your needs.

RTFC is uniquely positioned to provide relevant, practical and up-to-date instruction through our career staff, member company employees and adjunct faculty. We apply experience gained from actual incidents. We teach in depth from lessons learned in various emergencies. The Training Academy sharpens and refines techniques and teaches from the ground up.

*For additional information contact:*

**John D. Lowe, Division Chief**  
Refinery Terminal Fire Company  
Training Academy, P.O. Box 4162  
Corpus Christi, Texas 78469-4162  
Tel: 361-885-7127  
Fax: 361-241-0943  
E-mail: jdlowe@rtfc.org



## EMERGENCY SERVICES TRAINING INSTITUTE



*Pic courtesy of the Emergency Services Training Institute*

The Emergency Services Training Institute (ESTI) trains more than 50,000 emergency response personnel from each of the 50 United States and more than 40 countries each year. ESTI training addresses emergency response scenarios ranging from firefighting to rescue to emergency medical to hazardous materials. ESTI's state-of-the-art training takes place at the Brayton Fire Training Field in College Station, Texas, the Center for Marine Training and Safety (CMTS) in Galveston, Texas, at regional training sites located around the country, and at client locations worldwide. ESTI is one of several divisions of the Texas Engineering Extension Service (TEEX) that, combined, train more than 120,000 people each year in emergency and public works vocations. TEEX is a Member of The Texas A&M University System.

The Brayton Fire Training Field is one of the largest live-fueled, firefighter training facilities in the world. The 120-acre site is home to 132 "props" or specific training stations, including 22 fueled, live-fire props.

The props range from full-scale buildings to chemical plant structures, from aircraft to ships and trains, and include Disaster City, an urban infrastructure simulation complete with a shopping center, home, public assembly, and other buildings designed to simulate various states of collapse caused by a natural disaster or terrorist activity.

ESTI's training programs and courses are constantly revised and updated to incorporate the latest legal, technological, and procedural standards and innovations. Emergency responders are kept abreast of the new opportunities and developments in their fields and gain valuable classroom information and hands-on experience to better

handle the ever-changing dangers facing fire and rescue personnel. All ESTI instructors are certified and have extensive experience in their subject areas. Courses consist of quality interactive lectures and demonstrations conducted first in a classroom setting and later practiced during extensive hands-on training exercises using realistic full-scale training props and scenarios.

ESTI offers more than 130 courses to clients around the world; many of those courses are tailored for each delivery to address individual client needs and requirements. Courses meet or exceed the highest national standards – including NPQS, NFPA, DoD, US Coast Guard, EPA and OSHA. In addition, a Bachelor's Degree Program in Emergency Management Administration is available online.

*For further information, please contact:*

### **Emergency Services Training Institute**

301 Tarrow

College Station, TX 77840-7896

Tel: +1 866 878 8900 or

+1 979 845 7642

Website: [www.teex.com/esli](http://www.teex.com/esli)

## THE UNIVERSITY OF NEVADA, RENO FIRE SCIENCE ACADEMY

Offering one of the finest emergency response programs and training facilities in the world, the University of Nevada, Reno Fire Science Academy (FSA) includes a 426-acre, state-of-the-art campus in Carlin, Nevada, and specialized training programs conducted at our campus or customized and offered anywhere in the world.

### **Crisis and Emergency Management**

The FSA trains industries, organizations and governments in the preparation for, management of and recovery from crises and emergencies ranging from natural disasters to man-made emergencies and terrorism, including:

- Incident Command and Emergency Response
- Incident Command System (ICS) and Emergency Medical Services (EMS)
- Incident Safety Officer
- Developing and Implementing Tabletops, Drills and Exercises
- Hazardous Materials On-Scene Commander

### **Hazardous Materials/HAZWOPER**

The FSA trains in containment, confinement, decontamination, first responder and incident command, including:

- HAZWOPER/Hazmat First Responder Operations
- Hazmat On-Scene Commander
- HAZWOPER/Hazmat Technician and Refresher

- Hazmat Advanced Response
- Hazmat Chemistry
- Emergency Response Team (ERT) – Comprehensive Refresher Training

### **Industrial Fire Fighting**

The FSA has received worldwide recognition for its industrial courses, training props and use of liquid petroleum fuels, including:

- Industrial Firefighter I, II and Refresher
- Fireground Operations and Leadership
- Production Pipeline
- Mine Fire Brigade, Shipboard and Offshore Fires
- Emergency Response Team (ERT) – Comprehensive Refresher Training
- Industrial Firefighter Certificate Program

### **Aircraft Rescue and Fire Fighting (ARFF)**

The FSA is one of only a few in the world to offer aircraft fire simulation training with liquid petroleum fuel, including:

- ARFF/FAA/CFR 139.319 Annual Live-Fire Refresher
- ARFF 40-Hour CFR 139

### **Rescue Training**

The FSA's capabilities are second to none in training rescuers for demanding levels of performance, including:

- Introduction to Trench and Excavation Rescue
- Rope Rescue
- Confined Space Rescue
- Advanced Rescue
- Emergency Response Team (ERT) – Comprehensive Refresher Training

### **Instructional (Train-the-Trainer) Courses**

Techniques for delivering effective instruction and training to others are emphasized in these FSA courses.

### **Specialty and Customized Training Programs**

Our world-class facilities and instructors are available to companies and organizations that require specialized training. The FSA can also bring its programs to you, anywhere in the world.

*For More Information, please contact:*

### **University of Nevada, Reno**

Fire Science Academy

PO Box 877

100 University Avenue

Carlin, NV 89822

USA

Tel: (775) 754-6003 or

1-800-233-8928

E-mail: [fireacademy@unr.edu](mailto:fireacademy@unr.edu)

Website: [www.fireacademy.unr.edu](http://www.fireacademy.unr.edu)

## BUYERS GUIDE – HELMETS, BOOTS AND GLOVES



Along with their leading ranges of fire coats and trousers, **Bristol Uniforms** also supply a wide range of helmets, boots and gloves to meet the varying needs of firefighters in conventional, wildland and marine firefighting environments. PPE kit is also available for protection against the special hazards presented by motor vehicle accidents and chemical spillages.

A range of 6 different types of helmet covers the operational needs of firefighters in traditional and special situations. The traditional shaped multi-sized, adjustable glass fibre polyester helmet is manufactured to EN 443 and is available with a variety of options including polycarbonate visor, neck curtain or bubble shaped visor. Two glass fibre helmets manufactured to EN 397 with visors can be supplied with either a Heatshield or aluminised neck curtain. The range is completed by the close proximity helmet with epoxy coated aluminium finish and aluminised neck cape for use primarily with civil and military aviation authorities, oil and shipping companies and a close proximity helmet for use with breathing apparatus.

Gloves are available in a similar range of alternatives for different firefighting conditions. The traditional firefighters' glove is a five fingered pigskin leather construction with breathable waterproof lining and thermal barrier manufactured to EN 659 in a range of sizes. Both the aluminised backed and gauntlet style gloves have pigskin palms and aluminised backs. The gauntlet has extended wrist and lower arm protection whilst the aluminised backed glove features a Kevlar knitted wrist. The firefighters' leather glove is available in blue or black, manufactured to EN 659 and is lined with GORE-TEX® membrane and fully lined with Kevlar. Other products in the range meet specialist requirements and include a rubber glove for electrician's use on board ships and meets SOLAS requirements whilst the marine firefighting gauntlet is a thumb and mitten style with elasticated wrist and manufactured from Heatshield.

The boot range includes 4 styles manufactured to meet EN 345 and consists of 2 different types of firefighters' leather boots and two rubber options. All share the same characteristics of a steel toe cap and heat and oil resistant soles. Additional features within the range include steel mid soles, reflective tape, pull-on loops and energy absorbing soles. A special leather boot has a nitrile rubber sole and is resistant to oil and grease, anti-static and has a polymer foam interior for added comfort as well as a GORE-TEX® moisture barrier lining providing a breathable but waterproof boot. A firefighters' aluminised boot incorporates a neoprene commando heat and oil resistant sole and reinforced toe.

**For more information, please contact:**

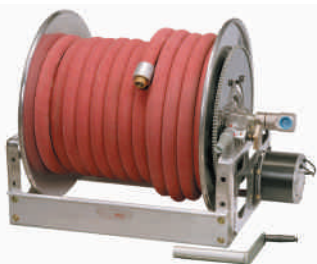
**Bristol Uniforms**

**Tel: +44 (0) 117-9 563101**

**Fax: +44 (0) 117-9 565927**

**Website: [www.bristoluniforms.co.uk](http://www.bristoluniforms.co.uk)**

## HANNAY F SERIES REELS IDEAL FOR BOOSTER HOSE



(Westerlo, NY) – Booster hose has long been the preferred first attack option for instant water supply, while larger volume hoses are being set up and charged. The combination of a booster hose and reel has proven to be the fastest, most reliable way to dispense and rewind fire hose.

The F Series Reel is a dependable, rugged reel that has set the standard for fire service reels for more than 50 years. Its strong, heavy-duty steel construction

allows for efficient handling of longer lengths of hose. Standard features include a gear-driven crank rewind and a pinion brake. Also supplied on the unit is a 1" 90-degree ball bearing swivel joint standard inlet with 1" female NPT threads. The standard outlet is a 1" male NST threads. Hannay F Series Reels operate at pressures up to 1000 psi.

**For more information, please contact:**

**Hannay Reels Inc.**

**Tel: 1.877.GO.REELS.**

**Fax: 1.800.REELING.**

**E-mail: [reels@hannay.com](mailto:reels@hannay.com)**

**Website: [www.hannay.com/fire](http://www.hannay.com/fire)**

## PPS OFFER VASTLY EXTENDED MASS DECONTAMINATION RANGE



A vast extension to their range of second generation mass decontamination technology is announced by **Professional Protection Systems**. All based on US articulating frame technology the units offered now range from an individual decon shower to a four line mass casualty

shelter. The latter type is currently being supplied by PPS to the Italian Government as part of its homeland defence programme.

All of the new PPS mass decontamination systems have certain elements in common. They can, for instance, be erected and ready for action in as little as two or three minutes by just two people, and without the need for an electricity supply or inflation device. Their structural integrity is considerable and tests to destruction have proved that they remain functional even if 30% of the framework is damaged or missing. Even entry level units of the new PPS range include an integrated shower requiring no installation plus internal and external contaminant containment and a UV stabilised, fire retardant and chemical resistant top canopy to provide natural ambient light. All units also come with a transport bag, ground sheet, windows, a utility ports repair facility and anchor kits. They are manufactured from break and tear resistant material that is resistant to degradation from extreme of heat and cold, oil or mildew as well as being flame resistant.

According to Mark Whitcher, MD of PPS the range has been developed to address the different scenarios anticipated by emergency planners from all over the world. For example in addition to mass casualty shelters the extended second generation PPS range includes shelters designed for use as field hospitals, command posts, casualty management facilities and even a temporary morgue. As part of a necessary extension of the decontamination process PPS is also now offering chemical and biological infection and control systems and isolation chambers. The former features full chemical and biological agent filtration.

All of these new units come with a comprehensive range of accessories, embracing everything from casualty conveyors and boards to portable air conditioners and water bladders, thus enabling the specifying organisation to achieve a highly customised product.

**For more information, please contact:**

**Professional Protection Systems**

**Tel: +44 (0) 1908 287 123**

**Fax: +44 (0) 1908 583741**

**E-mail: [sales@ppsgb.com](mailto:sales@ppsgb.com)**

**Website: [www.ppsgb.com](http://www.ppsgb.com)**

## ENVIRONMENTAL CONSIDERATIONS WHEN USING FIRE FIGHTING FOAM

Does environmental friendly fire fighting foam actually exist? How do you define "environmentally friendly"? Could it mean the foam actually improves the environment or does it simply mean it reduces damage done, to a minimum?



Let's consider the short and long term impact of fire fighting foams.

The first task of the any fire fighting foam should be to extinguish fire because the fire itself definitely has a bad effect on the environment. It is clear that AFFF is the fastest fire extinguishing agent available, however AFFF (along with FFFP and FP type foams), contain sustainable components. The fluoro surfactants will never break down and will remain as a water soluble component in the environment. Water, used by plants, animals, humans could remain "contaminated" for many years. Who knows what the long term effect of this will be? It all depends on toxicity levels, but there are definitely no natural components.

In the end It comes to a balance between environmental damage done by fire or by the foam that extinguishes it.

There are many fluorosurfactant free foams currently being introduced to the market, but there are also claims that they are less effective. Careful consideration must be given when deciding what foams to choose and of course measures against recognized fire performance standards must be achieved, but Arctic Re-Healing RF Foam gives a fire performance very close to AFFF performance yet contains no known harmful components.

Claims that immediate toxicity, mostly due by the fast biodegradation and oxygen depletion, could have an effect on fish or other aqueous life is easily resolved by dilution during disposal of concentrates.

The fact is that all the components used in Arctic Re-Healing RF Foams will biodegrade to natural occurring components. Act environmentally responsible and select Arctic Re-Healing RF Foam the foam with maximum fire performance and minimize the environmental LONG term impact.

**For more information, please contact:**  
**Solberg**

**UK: Tel: +44 (0) 870 240 5547**  
**NORWAY: Tel: +47 (0) 563 49700**  
**Web [www.arcticfoam.com](http://www.arcticfoam.com)**

## TYNE AND WEAR FIRE SERVICE TAKE THEIR LEVEL OF EFFICIENCY FURTHER



Tyne & Wear Fire and Rescue Service, held in high regard for their efficient and innovative operation has recently taken their efficiency a step further.

It was nearly two years ago that Tyne & Wear Fire Brigade implemented SMART Board™ for Plasma Displays in their command support vehicle in

the search for greater speed and efficiency of Command decision making.

As Assistant Chief Fire Officer Iain Bathgate explains; "Prior to the use of the SMART Boards all information on high risk premises were paper based. Selection of the correct premises plan, transfer by pen onto a traditional wooden whiteboard, and marking of key locations all had to be carried out before crews could be fully briefed. Post incident reviews and de-briefs involved redrawing the premises, and mapping out the stages of the incident."

Nearly two years ago the installation of a SMART Board in their Command Support Unit offered both the size and clarity of display that allowed for a more interactive incident environment where officers could see all the necessary information and participate easily.

"Although the initial product significantly raised our level of efficiency there were a couple of features of the software that comes with the board that were lacking", explains Adrian Brown, Station Officer – Operations Department. "We ideally wanted to be able to use drag and drop icons that were relevant to the Fire and

Rescue Service. We developed our requirements alongside SMART UK and now three months on, the latest version of the software, that we can download free of charge now offers the functionality that we requested. On a plan of the incident we can now drag and drop images of appliances, crew and in particular Health and Safety risks into place to build up a complete picture of the premises. As information is received from the incident sectors, the information builds the representation further.

Our second requirement was to be able to dynamically update the incident chronicle by exporting the amended plan of the background into a pdf file, which would provide an automatic audit trail of the incident. Once again, with support from SMART UK our request has been delivered free of charge.

We have also made use of the board's library function. We created an Excel spreadsheet with built in macros, so that, for example, when an additional vehicle arrives at the incident, adding in this information automatically calculates that we also have an additional five sets of breathing apparatus. The reduction in the amount of labour required for incident command and de-brief is considerable, as the audit trail has been created during the incident. Put the SMART Board software against the other software packages on the market that are very labour intensive and the difference is incomparable."

**For more information, please contact:**  
**Kevin Gladwin, Business Development Manager**  
**Steljes Group**  
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**Email: [kevin.gladwin@steljes.co.uk](mailto:kevin.gladwin@steljes.co.uk)**



Industrial fire planning, training, and operations are often singularly focused on supplying maximum flows for exposure protection, cooling, or fire suppression. Though the costs of these pre-suppression activities and the equipment required to provide maximum fire flows may

seem enormous, the dollar losses associated with damage from an actual incident, combined with the interruption and loss of production is of a far greater concern.

One tactic that is gaining widespread acceptance in this high flowing segment of the firefighting market is the construction and strategic installation of the "ULTRA-HYDRANT". Designed to supply mobile apparatus with multiple 5" or 6" supply lines from a single monster hydrant header, these custom designed installations can take full advantage of a facility's firewater flow capabilities.

A key part of the functionality of the "ULTRA-HYDRANT" is the integration of flow control valves for each discharge port, allowing supply lines to be independently controlled. An integral part of the "ULTRA-HYDRANT" distribution design is the new Task Force Tips Jumbo Gate Valve. This new gate valve is the clear choice for just some of the following reasons:

- The Jumbo Gate Valve's large unobstructed waterway will provide flows well over 2000gpm with less than 10psi loss.
- The Jumbo Gate Valve's swiveling outlet elbow reduces the possibility of flow restricting kinks.
- TFT's unique three-part corrosion protection process, and stainless valve components provide longer life in harsh industrial environments.

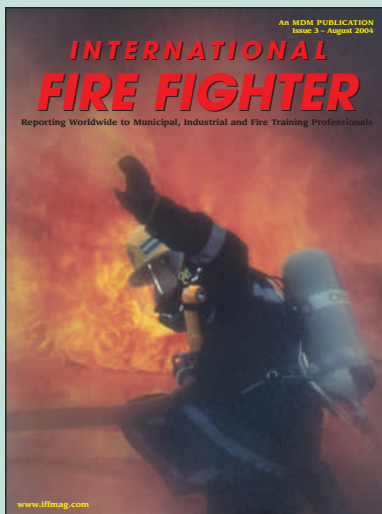
For additional information on TFT's full line of Jumbo Gate Valves, and Jumbo Wye and Siamese appliances, contact customer service at 800-348-2686 and request the new LDH hardware video. For more information on how to maximize your industrial fire flows, visit [www.tft.com](http://www.tft.com)

**For more information, please contact:**  
**Task Force Tips Inc**  
**Tel: +1 219 548 4000**  
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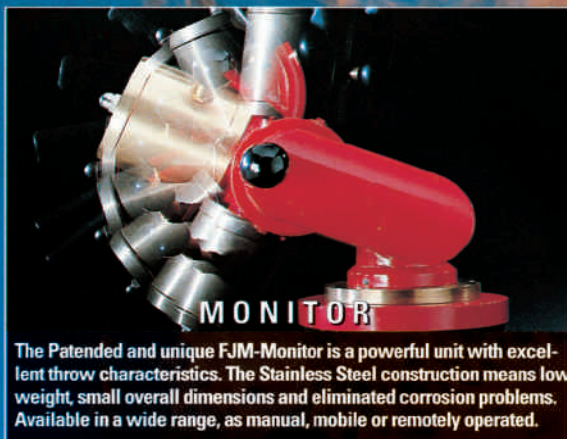
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THE BEST TRUCK.**

In this line of work, there's no room for error. You need a crew you can trust and equipment you can count on....day in and day out. Our wide range of fire apparatus is unsurpassed in quality. E-ONE has served the global market for decades. Our trucks are on call around the world 24 hours/7days a week — whether it be at Airports, Industrial sites or Municipal fire fighting units. Learn more at [www.e-one.com](http://www.e-one.com)



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### MONITOR

The Patented and unique FJM-Monitor is a powerful unit with excellent throw characteristics. The Stainless Steel construction means low weight, small overall dimensions and eliminated corrosion problems. Available in a wide range, as manual, mobile or remotely operated.

# comes to foam fire fighting systems, we've got it covered



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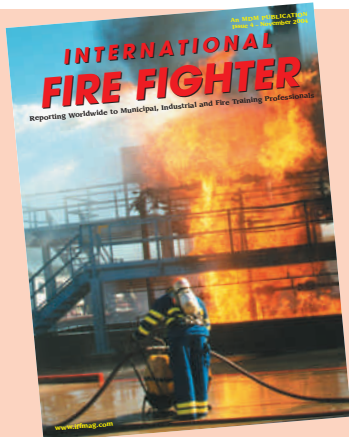


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## COMMENT

Welcome to the November edition of International Fire Fighter, which also marks our first complete year in publishing this title. I would like to take this opportunity to thank our contributing editors for supplying articles and offering advice on future stories. A big thank you must also go to all our advertisers for whom without, we simply could not exist and for keeping us up to date with the latest trends and technology in the constant battle to keep us all safe.

2005 is going to prove a very busy year for us all. Interschutz takes place next year in June and I look forward to seeing familiar faces as well as making new acquaintances. Singapore will be our first port of call for FESA followed shortly with the FDIC in Indianapolis, a few days to get our breath back and then Interschutz and the NFPA in Vegas. The autumn of next year is when the frequent flyer miles will build up with the IAFIC in Denver and the A+A in Dusseldorf. By the time our feet are back on firm ground, I should be writing my comment for the same issue again. Where does all the time go?

Once again, thank you to everyone who have involved themselves and supported International Fire Fighter (IFF) Magazine over the past year we really appreciate your input and I personally, look forward to working with you all again in 2005.

Have a very festive Christmas ( Hic!!!!) and a happy new year.

**Mark Bathard**  
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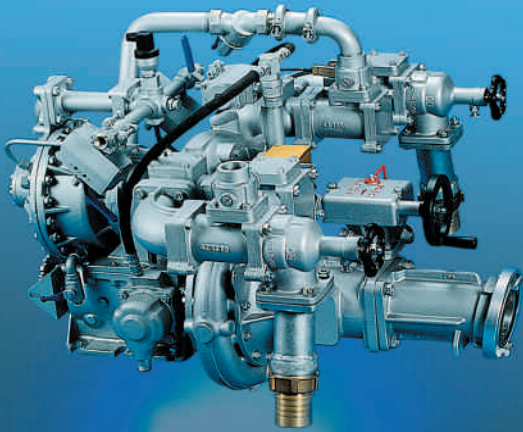
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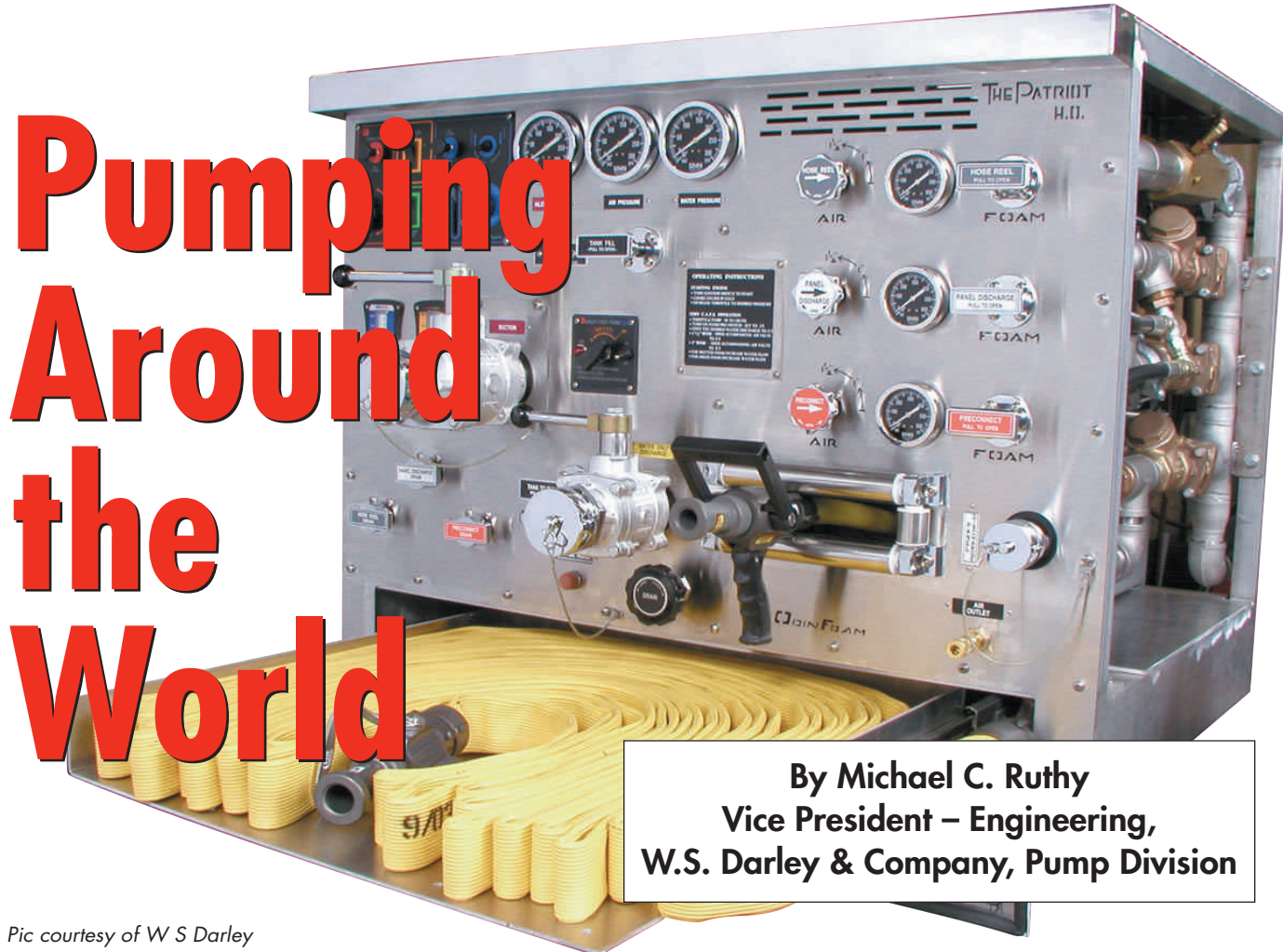
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# Pumping Around the World



**By Michael C. Ruthy**  
**Vice President – Engineering,**  
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*Pic courtesy of W S Darley*

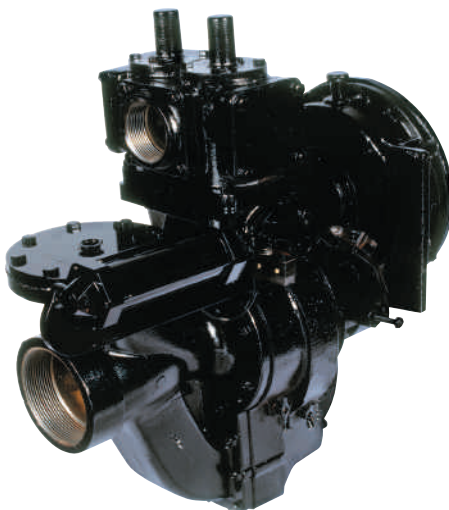
IMAGINE THE PERFECT FIRE pump, the pump ideal for fighting fires anywhere around the world. Having trouble? From a layperson's standpoint, it might seem that fighting a kitchen fire in Memphis would require the same strategy as fighting an identical fire in Melbourne, and if the strategy is the same, they would need the same pump. Some pump manufacturers even market what they call a "World Pump", further propelling this illusory idea into the minds of fire service personnel.

The opposite is true. For a variety of reasons, the pumps of fire services worldwide are diverging. Certainly, some techniques and methods are being shared as our understanding of fire suppression increases. But on a local level, changes in building practices and infrastructure force fire officials to tailor their pumping needs to the specific needs of their communities. Memphis will never be Melbourne.

The purpose of this article is to highlight some of the different types of pumps in use world-wide for fighting fires, and by doing so, perhaps spark some ideas where good practices can be shared. The fire pumps in Melbourne are generally very different from those in Memphis, or Manchester, or Münster for that matter. Each community's needs have resulted in a specific type of pump built for those needs, and pump manufacturers around the world have responded by designing an

ever-widening array of pump models to suit those applications.

The market most familiar to many, including the writer, is the US market.

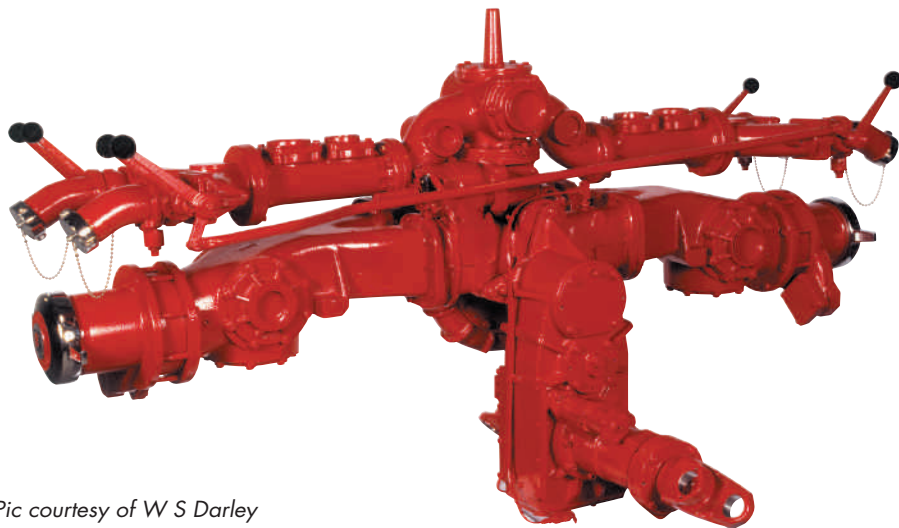


*Pic courtesy of W S Darley*

Here, fire pumps 250 US GPM (1000 LPM) and larger are usually built to conform to the NFPA 1901 Standard for Automotive Fire Apparatus, written by the National Fire Protection Agency. NFPA 1901 is a voluntary specification that in some localities has been written into local statutes, and in others is largely disregarded. Competing for attention are the specifications developed by ISO, a group that provides information for the insurance industry and who have their own requirements. Meeting the ISO requirements confers certain insurance benefits, such as lower insurance rates, for the citizens in a protected zone. However, these NFPA and ISO standards do not always agree on all features of a firetruck. NFPA 1901 has been an ongoing, changing, living document, while the ISO regulations have not adapted to new information as quickly, though there is currently considerable effort to bring them into accordance with one another.

The end result is that in the US, departments are rewarded for having larger pumps, whether they are appropriate or not. There are many localities that may only consist of a few dozen buildings and a volunteer department, but which boast about their 2000 GPM (8000 LPM) rated pumps. Several years ago, the





Pic courtesy of W S Darley

most popular pump rating was 1250 GPM (5000 LPM), but now that is changing to the 1500 GPM (6000 LPM) rating as this trend continues. Likewise, NFPA 1901 recently began recognizing pumps larger than 2000 GPM (8000 LPM) – all the way to 5000 GPM (20,000 LPM) for industrial applications. There are several implications for this trend toward larger pumps, implications that explain the current design of the US fire pump.

Pumps with higher rated capacities require more power to meet their rating points. Above the 1000 GPM rating or 1250 GPM rating, depending on engine and transmission, it becomes impossible to drive the pump with a transmission

mounted power-take-off (PTO) without exceeding the torque limits established by the PTO manufacturer. These conditions push US design toward using a midship pump, driven by a split-shaft transmission capable of diverting power from the main engine either toward the rear wheels or toward the pump.

Another factor is the relative abundance of water in parts of the US. Compared to cities worldwide, US cities are fairly new and usually have access to adequate water supplies, some western areas notwithstanding. In the population-dense Atlantic coastal region from Maine to Florida, water is considered by many to be a limitless commodity, and

infrastructure such as water mains and hydrants have been built with that mindset. Naturally, in a mindset that embraces abundant water, larger pump ratings are a natural result. "Surround it and drown it" is a US battle cry. Still, in a region that sees flooding regularly, a large pump is quite understandable.

In other parts of the world, tactics and pumps are different – vastly different, to say the least. In Europe, for example, most cities are older, and the streets narrower as a result. Additionally, the water systems can have components that are antiquated, and since the weakest link forms the limit for the water system pressure and flow capability, water delivery capabilities are generally lower. In Europe, there is also a stronger movement toward water conservation. For comparison, fire fighting in Europe compared to fire fighting in the US was once described to me by a German body builder as follows:

*In Germany, we go to a fire. We decide precisely how much water we need to extinguish the fire and we use that much water to put it out. In the US, you go to a fire, cut a hole in the roof, and fill the building up until the fire is out.*

It's a bit of a cruel stereotype of US operations, but I do recognize a bit of

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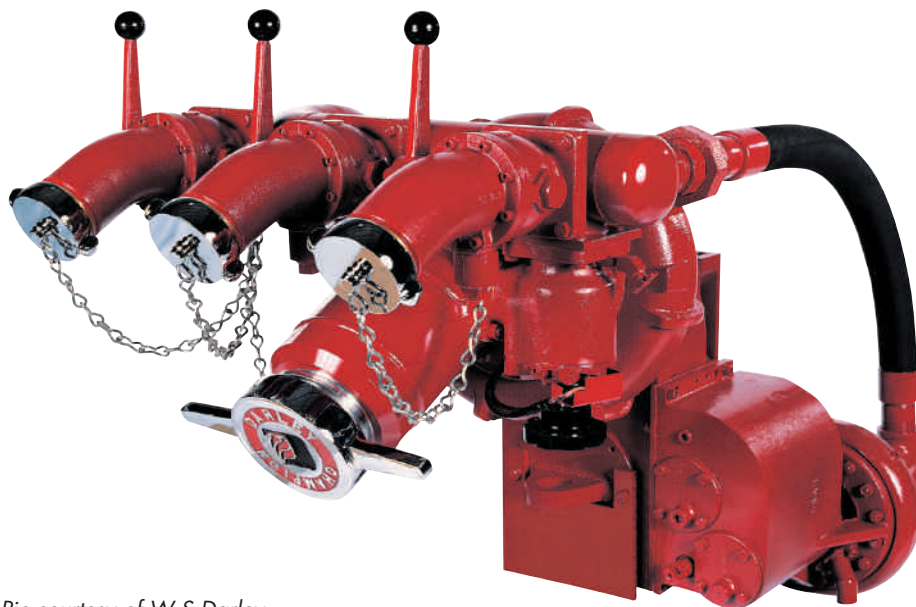
truth in it. It's not so much that the fires are different, but the procedures are different because the pumps are different, and that is because the infrastructure and forces driving the designs are different.

In Europe and the UK, the narrow streets have led to the adoption of a rear mounted pump. A rear mounted pump offers many benefits, such as moving the operator away from the side of the vehicle where he can be a target for traffic accidents. It also allows for a shorter, more maneuverable vehicle. Due to the limited water mains in many areas, the pump ratings are generally smaller than those in the US. A 1000 US GPM (4000 LPM) pump can often exceed the ability of a water hydrants in those areas, so pumps with larger ratings are generally not any more effective and therefore uncommon. Since the pump is smaller, it is generally driven by a PTO, making US-style splitshaft driven pumps quite rare.

Most trucks in Europe, the UK, and many former UK colonial areas such as New Zealand and Australia, are equipped with a high pressure booster pump. One could argue that this high pressure is necessary to compensate for the reduced pump flow capacities, but it is really just a great idea that the US fire

service failed to adopt. It isn't the fire service's fault so much as it is the pump manufacturers, since decades ago, the high pressure booster pumps available from the larger US manufacturers had inadequate flow capacities for their mission, leaving the fire fighters with a poor impression of the whole concept. The use of high pressure booster pumps in the US will never be predominant as a result.

The fact is that most fires are put out with the water onboard the truck. Studies in Melbourne have shown that most fires are extinguished with less than 100 US gallons (400 Liters) and that 93% of all fires can be contained to the room of origin with the water carried onboard the truck, using the high pressure booster pump for extinguishing the fire. This is quite a testament to its effectiveness. What makes it so effective is that



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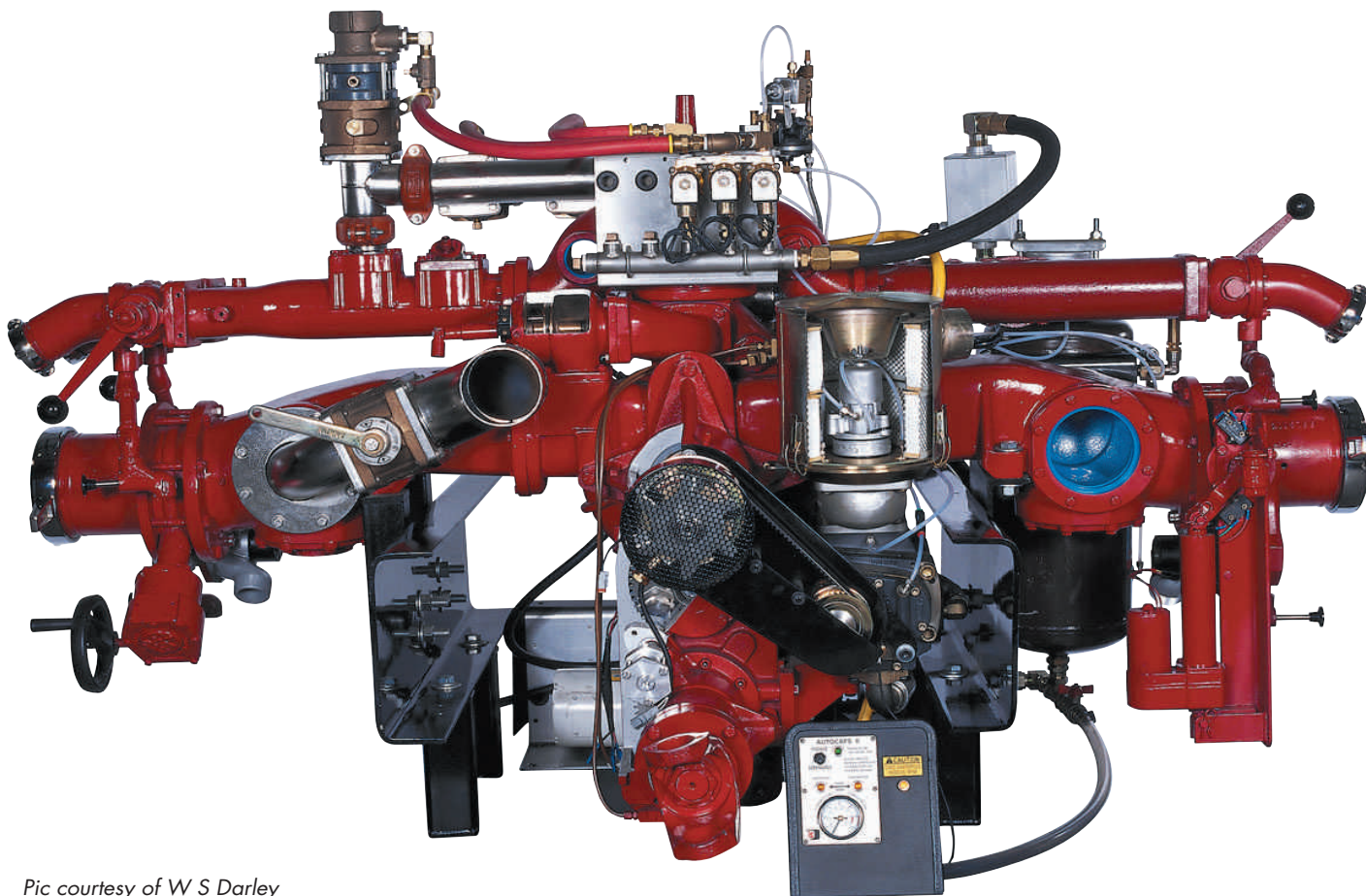
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the high pressure, typically 3000 kPa to 4000 kPa (435 psi to 580 psi) causes the water to atomize, creating more surface area to attack the fire. Also, in New Zealand and Australia, the booster pumps are generally larger in capacity than in other parts of the world, with

pressure pumps, both the booster pumps and the high pressure wildland pumps. In the wildland environment it truly shines, and the US wildland fire service has adopted it fairly eagerly. The Australian fire services have been a bit slower, but are starting to experiment

extinguishment – the only effective arguments against its adoption have centered on the higher initial cost. The higher complexity of operating CAFS systems built 10 or 15 years ago has left a lingering fear that CAFS is harder to use, but the truth is today's compressed air



*Pic courtesy of W S Darley*

flow capabilities of 200 US GPM (750 LPM) typically being specified.

Wildland areas worldwide are probably the closest in terms of pump design and performance. The common constraints of lack of water and generally rugged terrain, often with large changes in elevation, have led to many of the wildland pumps being much more similar than the pumps found in city or village departments. Most wildland pumps are designed for high pressure and relatively lower flow. A common model is a PTO or engine driven 500 GPM (2000 LPM) two-stage pump, which can achieve high pressure operation up to 500 psi (3500 kPa) or high flows exceeding 500 GPM (2000 LPM) for water transfer. Both Western US and Australia, which share many of the same geographical issues, have adopted this model to a large extent.

The latest trend in pumps, however, is compressed air foam systems, or CAFS. This trend has the potential to take over a considerable number of the applications that are currently using high

with some of their first units. The ability of CAFS to fight fires effectively with sometimes one tenth the water usage is a key benefit in those wildland areas where the only water available has to be brought in by truck. The benefits of high pressure pumps, such as lighters hose and the ability to pump extended distances uphill, are shared by both CAFS and high pressure pumps, but CAFS is the clear winner in being able to apply effective exposure protection in front of a fire front, so that the building structures can withstand the fire unscathed while the surrounding area is severely burnt. Most of us have seen the dramatic photos that make it clear that this technology will eventually be adopted by most wildland services and will largely supplant the high pressure pump except in extremely cost sensitive installations.

The value of CAFS in all settings, even urban conditions where plentiful water supplies are available, is not under dispute. No study has shown it to be less effective than any other means of

foam systems can be operated with the flick of one switch. It seems by focusing on CAFS, we might achieve this dream of the perfect pump, for all conditions, around the world.

When I consider the range of CAFS products that enter the marketplace every year, from Inteleguard's "micro-CAFS" concept of backpack portable systems; Odin Foam's concept of wildland engine-powered modules; Darley's Auto-CAFS concept of easy to use, safety-conscious systems for urban interface and metropolitan use; and even the engine-driven but hydraulically-coupled ultra-high-end system Rosenbauer showed at the last Interschutz in Augsburg, Germany, it becomes obvious that the perfect pump for all departments will never exist.





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# Gas safety in confined spaces

*This article discusses the gas hazards threatening workers in confined spaces and the detection equipment available to protect them.*



By Kevin Honner

Pic courtesy of Crowcon

AN ENGINEER REPAIRS BURIED cables; a plant manager enters a small plant room; a contractor inspects the lining of a sewage pipe. All these personnel face a common danger, despite working in widely different industries. Gas-related injury poses a serious threat in any confined space where the free movement of air is limited.

In regulation 1910.146, OSHA defines a confined space as any space which is large enough for someone to enter and perform assigned work, which has limited means of entry or exit, and which is not designed for continuous employee occupancy. They require any employer to evaluate the risks these workplaces pose to their employees and then monitor to prevent them. In most cases, both the assessment and the safe working system will require testing of the atmosphere with gas detection equipment.

The risks can be divided into three categories: combustible gas, toxic gas, and high or low oxygen levels. It is of course the duty of employers to find alternatives to manned work in these areas wherever possible. However, in many cases such work cannot practicably be avoided, and so the priority must be to make it as safe as possible.

## COMBUSTIBLE GAS RISKS

For combustion to occur, the air must contain a minimum concentration of

combustible gas or vapor. This quantity is called the lower explosive limit or LEL. At concentrations equal to or greater than this, combustion will occur in the presence of a suitable ignition source. For most combustible gases and vapors, the LEL is less than 5% by volume. OSHA defines a combustible atmosphere as "hazardous" at 10% LEL.

Typically, storage vessels which have contained hydrocarbon fuels and oils present a danger. Other dangers come from fuel leaks: pipelines, gas cylinders and engine-driven plant.

For workers in pits, sewers and other sub-surface locations, methane is an almost universal danger. Formed by decaying organic matter, this odorless gas collects in pockets underground.

## TOXIC GASES AND VAPORS

Confined space workers may be exposed to any of a large number of toxic compounds depending on the nature of the work and its environment. OSHA requires

a risk assessment to be made of which toxic substances a worker may be exposed to in any given work situation.

When generators are used in a confined space, for example, carbon monoxide in the exhaust fumes creates a serious poisoning risk. Workers near to traffic on roads may be exposed to carbon monoxide and nitrogen dioxide from vehicle exhaust fumes. The decomposing action of bacteria on organic matter releases toxic hydrogen sulfide and carbon dioxide, both of which are common subsurface hazards.

## OXYGEN – TOO HIGH OR TOO LOW?

The normal concentration of oxygen in fresh air is 20.9%. OSHA considers an atmosphere to be hazardous if the concentration of oxygen drops below 19.5% or goes above 23.5%. If the concentration falls to 17%, mental and physical agility are noticeably impaired; death comes very quickly if it drops only a few percent more. At these levels unconsciousness takes hold so rapidly that the victim will be unaware of what is happening.

Without adequate ventilation, the simple act of breathing will cause the oxygen level to fall surprisingly quickly. Combustion also uses up oxygen, which means



*Pic courtesy of Crowcon*

that engine-driven plant and naked flames such as welding torches are potential hazards. A less obvious risk is the fermentation of rotting vegetable matter, which absorbs oxygen and may create a hazard in agricultural storage units. Steel vessels and chambers which have been closed for some time are similarly dangerous because corrosion may have occurred, using up vital oxygen in the process.

Oxygen can also be displaced. Nitrogen, for example, when used to purge hydrocarbon storage vessels prior to re-use, drives oxygen out of the container and leaves it highly dangerous until thoroughly ventilated.

High oxygen levels are also dangerous. As with too little, too much will impair the victim's ability to think clearly and act sensibly. Moreover, oxygen-enriched atmospheres represent a severe fire hazard. From clothing to grease, materials which would not normally burn become subject to spontaneous combustion under these conditions. Common causes of oxygen enrichment include leaks from welding cylinders and even from breathing apparatus.

#### EQUIPMENT TYPES

The most basic means of detecting a gas hazard is a colorimetric tube, where a color change occurs when gas is present. However, as this only provides a "snapshot" of gas levels at the moment the operator chooses to take a reading, it is

unsuitable for long-term monitoring of changing conditions. More appropriate are electronic detection and alarm products which provide continuous monitoring.

Portable electronic units and larger fixed systems can be used for confined space monitoring. Fixed systems typically comprise one or more detector "heads" connected to a separate control panel; if a detector "sees" a dangerous gas level, the panel raises the alarm by triggering external sirens and beacons. This sort of installation is suited to locations like plant rooms which have sufficient room for the hardware.

However, much confined space work takes place in more restricted areas, making compact portable units more suitable. Combining one or

more sensors with powerful audible and visual signals to warn when pre-set gas levels are reached, portable detectors can be carried or worn wherever they are needed. In addition, a small instrument is easily carried in a confined space, ensuring that pockets of high gas concentration are not missed.

Simple portable detectors contain a single sensor for a specific gas. They are ideal for protecting workers where a risk assessment has identified only one foreseeable hazard. A relatively recent addition to this market, the most basic products are so-called disposable detectors. Activated by the user when first required, they run continuously without maintenance for a set period, typically two years.

#### INCREASED INFORMATION

More sophisticated but only slightly larger are one-channel detectors with an illuminated display showing measured gas levels. Unlike disposable products, these units are designed for servicing rather than replacement, have rechargeable or replaceable batteries, and generally allow the user to set alarm levels. They may also offer datalogging, a valuable feature which stores recorded gas levels for subsequent downloading and review, and so builds a long-term picture of users' exposure to fluctuating gas levels.

Often, more than one hazard may be foreseeable in a single area. In such cases, multi-channel instruments are used. These generally monitor up to four gases

together, with a typical sensor array for underground work covering combustible hydrocarbons, oxygen, hydrogen sulfide and carbon monoxide. A wide range of other sensors can be specified, making this type of unit suitable for most confined space applications. The slightly larger physical dimensions of a multi-gas detector allow for bigger displays showing a range of gas data, sometimes from all channels simultaneously, as well as useful information relating to calibration and configuration.

Some multi-channel units incorporate a built-in sampling pump, allowing a flexible sample line to be fed into the space while the monitor remains outside with the user. This easily enables the user to test the atmosphere before entry into the confined space. This is a key requirement of the OSHA 1910.146 confined spaces entry regulation. Obviously, it is important that the sample line is free of kinks and blockages, and that sufficient time is allowed for the gas drawn from the chamber to arrive at the sensor.

Timed interval monitoring is particularly helpful in the oil and petrochemical industries. When a vessel which has held combustible liquids is purged with inert gas, a monitor is set up outside to record falling hydrocarbon levels and indicate when it is safe to open the container to air. The latest portable detectors incorporate an infrared sensor for just this purpose because, unlike conventional sensors for combustible gas monitoring, infrared devices can operate in the absence of oxygen and in the presence of very high hydrocarbon levels.

#### UNIVERSAL FEATURES

Certain features should be expected in every portable gas detector. Clearly, life-saving tools for demanding environments must be as tough as possible, with reliable electronics housed in impact-resistant casings. Additional protection may be provided in some cases by a removable rubber "boot". While the need to leave gas sensors exposed to the atmosphere means that no instrument can be fully sealed, a high degree of protection against dust and water ingress is essential. Toughness notwithstanding, a well-designed detector will also be light and compact enough to wear for an entire shift.

Finally, because of the difficulties of working in a cramped space, perhaps under poor lighting, instruments should be simple to use. No matter how advanced a detector's internal architecture or data management options, personnel in the field should be faced with nothing more daunting than a clear display and as few buttons and controls as possible.



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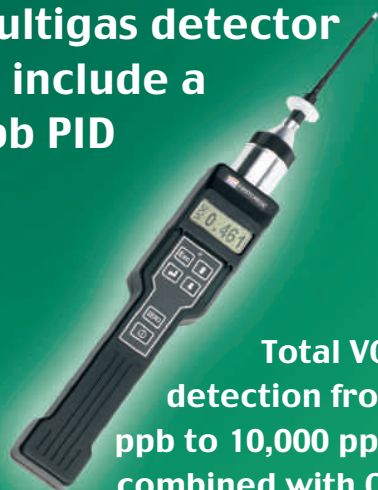


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atmospheric contaminants and conditions such as combustible gas and vapor accumulations, oxygen deficiencies, and toxic gases such as carbon monoxide, hydrogen sulfide, carbon dioxide, and many other commonly encountered atmospheric hazards. The Company's products are used in oil industry, health and safety, HAZMAT, toxic industrial chemical (TIC), petrochemical and confined space entry monitoring programs all over the world. BW has significant numbers of instruments currently in service with the United States Coast Guard and other branches of the United States Department of Homeland Security. BW products are used in all major United States manufacturing industries, as well by numerous city, state and federal agencies and departments. A substantial number of oil refineries, oil and gas production sites, municipal agencies and city departments have standardized their programs on BW confined space and maintenance-free personal gas detection products.

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The key to the Company's rapid growth and success with customers has been BW's "More for less" philosophy. Each succeeding generation of BW products offers even better features and enhancements in capabilities, at ever-lower prices. BW Technologies' products are known by customers and competitors alike for having the lowest cost of ownership, and best price to value ratio in the gas detection industry.

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Industry leading products designed and manufactured by BW Technologies include the **GasAlert Extreme** family of zero-maintenance and single-sensor personal gas detectors; the **GasAlertMicro**, the world's most popular confined space gas detector; the **GasAlertMax** multi-gas detector with integral pump; and the **Rig Rat III** family of wirelessly integrated and "stand-alone" monitoring systems.

Complete product information, manuals and support materials are available at the **BW Technologies** Internet site at [www.gasmonitors.com](http://www.gasmonitors.com); or contact BW directly at 1-403-248-9226.

## BW TECHNOLOGIES LTD.

**B**W Technologies Ltd. designs, manufactures and markets a full line of portable and fixed gas-detection equipment. BW Technologies was founded in 1987 by President and CEO, Cody Slater. Today, BW is recognized as one of the World's leading manufacturers of technologically advanced zero-maintenance, single and multiple-sensor atmospheric monitors, permanently installed gas detection systems, and wirelessly integrated gas detection systems. On June 11, 2004 BW Technologies was acquired by First Technology PLC and is traded on the London Stock Exchange under the symbol FRS.

Based in Calgary, Alberta, in the foothills of the Canadian Rockies, BW is a progressive, high-tech company with manufacturing, sales and distribution networks spanning the entire globe. In July 2001, BW moved into a new, 33,000

square-foot, state-of-the-art manufacturing and headquarters facility in Calgary, Canada. BW additionally maintains major sales and customer support centers in Arlington, Texas to support USA and Latin American sales, and in Oxfordshire, England, to support European and other international sales. BW also maintains sales offices in Australia, Singapore, Hong Kong and the Middle East. All operations are ISO 9001 certified.

In 2003, Vulcain Alarme Inc. of Montreal, Canada joined BW, enhancing Company's range of fixed, HVAC and commercial contractor market gas detection products. Further expanding the BW product line, an additional alliance was formed in 2003 when Manning Systems Inc. of Lenexa, Kansas, joined BW. A recognized leader in refrigerant application gas detection, Manning has offered precision gas alarm and leak detector equipment since 1981. Manning leads the US market in ambient air ammonia monitoring for food storage and processing facilities. These recent alliances have enhanced the range of fixed, commercial market gas detection products and expertise available through the growing BW banner.

BW products are used to detect and measure a wide variety of dangerous





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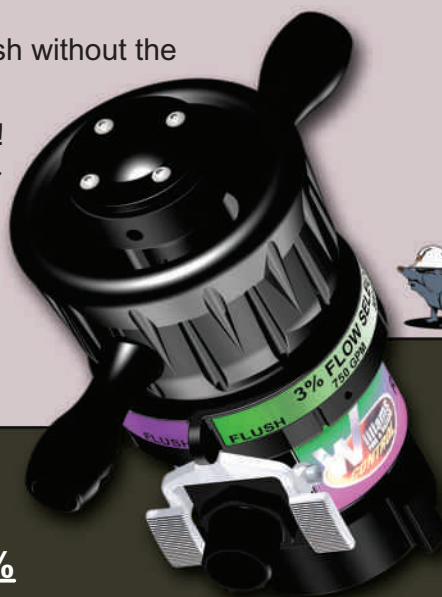


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# The Breathing Apparatus When Only Fire



Styrene leakage

By Lta Tan Kim Guan,  
Senior Instructor

Fire Fighting Specialists Branch, Specialists  
Training Wing, Civil Defence Academy,  
Singapore Civil Defence Force

WHEN CONDUCTING FIREFIGHTING AND rescue operations, firefighters would often need to work in environments in which smoke and toxic or noxious fumes may be present. The burning of plastic materials can give off poisonous gases, whilst leaking chemicals in hazardous material incidents can release poisonous fumes. Thick dust clouds can also result from collapsed structures, such as the choking conditions experienced by responders during the September 11th terrorist attacks on the World Trade Centre in New York City. These can all provide an untenable environment for firefighters and rescuers.

The continued development of the breathing apparatus (BA) has therefore been crucial for rescuers, firefighters and hazmat responders alike. It has allowed them to operate in the most hostile of conditions and, more importantly, reach casualties and save lives. The development of the BA Airline has made further inroads into the use of the BA set by prolonging its usage.

## THE AIRLINE ADVANTAGE

In its standard form, conforming to BS 4667 Part 3, the BA Airline essentially comprises a facemask, a demand valve and a length of hose. This hose is connected to compressed air cylinders which provide the air supply. The cylinders are located outside the risk area. Either one or two users may be connected to the BA Airline.

The BA Airline provides several hours of respiratory protection to its users as continuous air supply can be maintained through the airlines linked to a cascade of cylinders and to the open circuit facemask and regulator. The

smaller air cylinders of a BA set have a limited capacity and would hence require frequent replacement.

This extended supply of oxygen in

turn allows rescuers and firefighters more working time, enhancing both their operational effectiveness and confidence. One limitation of a BA Airline, however, is that it does not facilitate the users to make multiple turns, or to penetrate into confined spaces with obstacles that require significant maneuvering.

BA Airline users also don self-contained breathing apparatus during operations. The latter serves as a back up should the Airline user encounter difficulties such as entangled, kinked or ruptured hoses.



Decontamination in progress (part of a training session at the Civil Defence Academy, SCDF)



# Apparatus Airline: Fresh Air Will Do

## Safety Considerations

- The Airline user should also be equipped with a Distress Signal Unit, a torch and communication equipment so that he may remain in touch with the BA Control Officer (BACO).
- The Airline hose shall not exceed 90 metres, or a pressure reduction in the hose may take place. When this happens, the wearer may begin to consume and exhaust the air from his standby BA cylinder.
- Not more than two Airline wearers should be connected to any single airline. This is to ensure that there is adequate, continuous uninterrupted air supply. A third Airline wearer would seriously reduce the air contents and compromise their safety.
- A BACO shall monitor the entry and exit of Airline wearers, taking note of their entry/exit time. He shall also standby an emergency team to initiate emergency search procedures should an Airline team fail to return on time or radio communication is lost.
- The air cylinders should also be closely monitored for their contents to ensure that there is sufficient air supply. Provision should also be made available to rapidly replace depleted cylinders.

*(Additional precautionary measures are documented in the Manual of Firemanship under "Breathing apparatus and resuscitation".)*

### STYRENE SPILL INCIDENT: THE BA AIRLINE IN USE

On 24th October 2001, SCDF Hazmat Responders from the Tuas Fire Station attended to a chemical incident involving leakage of Styrene from a 600m<sup>3</sup> (430 Metric Ton) storage tank. Styrene is a chemical known for its flammability and explosive characteristics, with a flash point of 32 degree celsius.

When the Hazmat Responders arrived at about 1430 hrs, Styrene was seen splashing rapidly out of one of the delivery valves. Exposed styrene vapour can ignite explosively should it come into contact with an ignition source.

Under the sweltering heat of the

afternoon sun, the initial task was to initiate isolation and cooling operations. The leaking chemical had to be

*Under the sweltering heat of the afternoon sun, the initial task was to initiate isolation and cooling operations. The leaking chemical had to be isolated and prevented from excess heat source or naked flames.*



*BA airline equipment*

isolated and prevented from excess heat source or naked flames. Foam and water were used for these operations. The tank from which the chemical was leaking from was gradually cooled down which prevented the leaking Styrene vapour from reaching its flash point.

In addition, the Hazmat responders had to mitigate the leakage as soon as possible. Donning chemical suits for respiratory and body protection, they effectively plugged the leaking valve and

## The Breathing Apparatus Airline: When Only Fresh Air Will Do

transferred the remaining Styrene from the tank to an International Standard Organisation (ISO) tanker. The entire operation took more than an hour.

Throughout the operation, the BA Airline proved essential. It provided the responders more time and flexibility to carry out the elaborate and careful mitigation and subsequent decontamination procedures. The combination of cumbersome chemical suits and the extended duration of this operation demanded greater strength and stamina from responders – something which the extended capabilities of the BA Airline easily supported.



*Hazmat Responders conveying a casualty during a simulated Hazmat incident*

The use of the normal BA equipment with their limited air supply would have greatly handicapped the operations, requiring the users to replace their cylinders every 30 to 45 minutes. (A cylinder with 9 litres of air contents would normally last for about 35 minutes.) This would have required the users to leave the hot zone in the midst


of their operations, undergo decontamination process, remove their chemical suits and replace their depleted BA cylinders. Alternatively, It would have required deployment of more hazmat respondents to take over those who needed to leave the scene to replace their depleting cylinders. In all, the situation would have been unnecessarily prolonged with excess dependence on manpower and equipment.

*The use of the normal BA equipment with their limited air supply would have greatly handicapped the operations, requiring the users to replace their cylinders every 30 to 45 minutes.*

### FURTHER USES OF THE AIRLINE

The BA Airline offers widespread use for the SCDF. Aside from Hazmat operations, the SCDF has improvised its usage for the operation of commonly used pneumatic equipment such as the Airgun, Leak-sealing Lance, Pneumatic Cutter and Air Lifting Bag. This has been achieved by connecting them to the BA Airline which supplies the compressed air at the operation ground.

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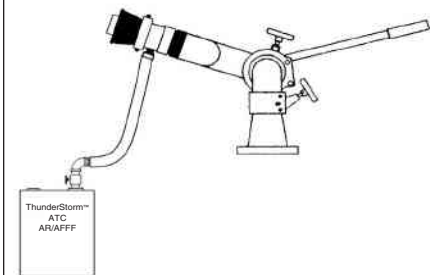
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**Industrial**







# Fixed exting making the

By Andy Shiner

*Pic courtesy of Macron Safety Systems*

IT IS CLEAR FROM much that we hear about fixed extinguishing systems, and particularly on replacements for halon, that narrow commercial interests can so very easily get in the way of a factual analysis of the options that are now available. According to Andrew Shiner, Director of Marketing, Europe, Middle East and Africa for Tyco Fire and Security's Fire Suppression Products Group, if you want to be sure of getting a balanced view, it is important speak to a supplier that can offer a choice of systems for, he argues, there is more than one solution when it comes to protecting critical business assets.

Perhaps I should make it clear from the outset that, unlike some companies expressing a view on fixed extinguishing systems and halon replacements, Tyco Fire and Security is not wedded to one particular solution. The organisation markets gaseous systems such as FM-200® and CO<sub>2</sub>, inert gas systems and fluid fire suppressants. This means that we can bring to the debate a view that is not distorted by the need to promote a particular option.

Really, we should start any discussion by getting a few irrefutable facts straight, as much of the debate surrounding fixed extinguishing systems over recent years has been inspired by the banning of halon. Vested interest in one system or another has frequently resulted in commercial prejudice being portrayed as "fact". So let us start by getting a clear and unbiased understanding of what triggered the debate – the Montreal Protocol.

The Montreal Protocol was signed by 186 countries and provides the legal framework to globally reduce emissions of ozone-depleting substances that, typically, were used in industrial processes, refrigeration, as propellants for aerosols, and in fire fighting. When

the Protocol was signed in the early 1990s, HFC – hydrofluorocarbon – systems were widely accepted as a suitable alternative to Halon 1301.

Today, while certainly other non-HFC options are available, HFC systems, such as FM-200, are still very prominent in the international marketplace. Contrary to a wholly unfounded statement I read recently in the trade press, HFCs have not been banned in Sweden or Norway, and suggestions that they have been banned in Denmark are equally incorrect because their use for fire suppression was never permitted in Denmark.

This phasing out of ozone depleting substances continues and Article V countries – the developing nations – have another six years, until 2010, to conclude their phase-out programmes. This process has resulted in a decline in the amount of ozone depleting substances in the atmosphere and expert predictions today indicate that the ozone layer will recover later this century. Without doubt, HFCs, far from being the guilty party that some – with vested interests – would portray, have helped make this commendable improvement possible.

## THE ROLE OF HFC SUPPRESSANTS

Opponents of HFC systems often rely on the global warming argument to discredit their use. However, these often highly verbal opponents frequently fail to put the global warming issue into a real context. Emissions from HFC fire suppression systems are extremely low and the main culprits, which collectively account for a staggering 98 percent of emissions, are methane, nitrous oxide and CO<sub>2</sub> – carbon dioxide.

It also needs to be recognised that critical-use applications of HFCs, protecting computer suites, telecommunications centres and the like, that would once have been protected with a Halon 1301 installation, represent a very small share of the fire protection market. Globally, authoritative studies have suggested, this is no more than three percent to four percent of the overall firefighting market.

The truth of the matter is that HFCs are ideal fire fighting agents and are most appropriate where speed of suppression, space for cylinder storage and weight are the determining factors. Inert gases are most appropriate where speed of discharge is deemed less important and where there is considerably more space available for cylinder storage. Typically, an inert gas system requires up to seven times the storage space of FM-200 and ten times the storage space of a comparable Halon 1301 system. However, they are certainly popular with companies where specifying a zero ozone depleting, non-chemical product is of paramount importance. Both types of system are appropriate for protecting occupied spaces.



# Extinguishers – the right choice



## HALON REPLACEMENT OPTIONS

In certain instances, CO<sub>2</sub> is still an appropriate choice. However, it is unsuitable for applications where people are likely to be subjected to exposure to the gas, as it represents a serious toxic hazard and risk to life. Its use for protecting manned communications centres, computer suites or process control centres is, therefore, wholly inappropriate. In unmanned environments though, such as switchgear rooms, it remains an entirely acceptable and effective choice.

Of the HFC contenders, FM-200 has probably enjoyed the greatest success in recent years, and has been installed to protect telecommunications centres and computer installations throughout North America, Europe, the Middle East, Southern Africa and the Far East. It fits the bill in several important respects; it is fast and it causes no damage to sensitive electronic equipment. It also represents no risk to the room's occupants; it is free from any toxic side effects and offers zero ozone depletion.

Inert gas systems, which are equally as popular globally, do not, in common with other clean agents, leave sooty or greasy deposits to damage sensitive

*Pic courtesy of Macron Safety Systems*

electrical or electronic equipment. Even though they do, like CO<sub>2</sub>, rely on oxygen depletion as the method of extinguishing fire, they are an undeniably safer option than a stand-alone carbon dioxide suppression system.

In reality, each of these systems has its own drawbacks, in some cases application-specific, as in the case of the extra space required for inert gas systems, and in some cases overriding – namely CO<sub>2</sub>'s toxicity. Which brings us to the latest fire suppression technology for protecting business-critical assets.

## NEW SUSTAINABLE TECHNOLOGY

The latest solution meets all of the market's requirements. It is a high performance fire extinguishing agent that has a negligible impact on the environment. It also has an insignificant global warming potential, lower than any of the halocarbon agents acceptable for use in occupied spaces.

Tyco Fire and Security's fluid-based fire protection system is called Sapphire®, and it has several end user advantages over other Halon 1301 alternatives. It has a footprint similar to that of chemically-based clean agent systems and the lowest level of design concentration and the highest safety margin of any viable Halon 1301 or chemical alternative. Sapphire has impressive "environmental footprint" credentials with zero ozone depleting potential and a remarkably low atmospheric lifetime of just five days. Significantly, it is not included in the basket of greenhouse gasses identified by the Kyoto Protocol.

The fluid is stored in cylinders as a low vapour pressure fluid that transmutes into a colourless and odourless gas when discharged. Unlike other fluid fire extinguishing agents, it can be used with absolute confidence to suppress fires involving electronic, computing or communications equipment. This has been graphically demonstrated by immersing a laptop computer into a tank of Sapphire fluid and showing that, not only does the laptop still work after the dunking, it works while it is still immersed in the tank. Similarly, the suppressant's suitability for protecting archives and museums has been established in similar trials that prove that, not only can you immerse a document in the Sapphire fluid without damaging it, the ink will not even run!

Typical total flooding applications use between just four and six percent by volume of the fluid, which is well below the agent's saturation or condensation level and, when discharged, the agent is dispersed through natural ventilation, leaving no residue to damage sensitive electronic equipment; it is also non-conductive and non-corrosive.

## MAKING THE RIGHT CHOICE

So, how does the end user make the right choice? The answer surely lies in making sure that he or she gets expert advice. And if that advice is sought from a company that offers just one solution, do not be too surprised if it falls somewhat short of being unbiased.

My recommendation is that end users should go to an expert supplier that can offer a choice of solutions. One that is competent to design and engineer the installation based on a thorough risk assessment and a clear understanding of the customer's precise needs and priorities. It should go without saying that, whichever solution is chosen, the system should be certified by internationally recognised approvals.



*Pic courtesy of Macron Safety Systems*



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International Aviation Fire Protection Association

# Aviation Fire Europe 2004

By DO Pete Wise BA(Hons) MIFireE  
Terminal 5 Liaison  
London Fire Brigade

Pic courtesy of The IAFPA

FROM OCTOBER 6–8, 2004, the International Aviation Fire Protection Association staged the Aviation Fire Europe 2004 conference in Amsterdam, the Netherlands.

The conference, held at the Dorint Sofitel Hotel, attracted a wide audience from around the globe and from all sectors of the aviation fire safety industry. The conference was judged a success, giving the delegates the opportunity to update their knowledge on varied subjects, such as airport rescue and firefighting vehicle design, terrorism in the aviation environment and risk management in airport terminals. The conference also provided good opportunities to network and meet the delegates in a very comfortable social setting.

The delegates registered on Tuesday and were treated to a display of various firefighting tactics used on aircraft fires at the state-of-the-art ARFF training facility at Schiphol Airport, hosted by the Amsterdam Airport Schiphol Fire Service. This also gave the airport fire service the opportunity to demonstrate its E-One ARFF fire vehicles. The visit was followed by a drinks reception at the hotel in the evening.

On Wednesday, after an initial welcome by John Trew, Chairman

of the IAFPA, the conference was formally opened by Mr G.A.J.M van Strien, Director of Fire and Disaster Control, Ministry of the Interior, The Netherlands. Mr van Strien highlighted the way in which, following 9/11, the Netherlands has been changing its organisational structure and how the emergency services prepare for disasters. To face up to the new risks the new structures now represent an integrated approach to disaster planning and management, supported by changes in legislation.



Pic courtesy of The IAFPA

The first paper, *Interior Fire Attack on Commercial Aircraft*, concentration on fireground operations and was presented by Danny Pierce, airport Safety Officer, Los Angeles Airport, USA. Dan gave a fascinating round-up of the problems confronted by the modern firefighter when faced with an interior aircraft fire. This is illustrated by the imminent introduction of the Airbus A380 and the challenges for firefighting and rescue that this aircraft will bring. Dan then outlined the new tools and technologies that are available to the aviation firefighter to face these challenges, such as the use of snozzle, piercing tools and positive pressure ventilation.

The following paper, entitled *Recognised Primed Decision Making as a precondition for ARFF scenarios*, was given by Ed Oomes, Fire Prevention and Contingency Planning Manager, Amsterdam Airport Schiphol Fire Service. Mr Oomes posed the interesting question: how does the incident commander cope with the demands of the necessary decision-making process within the initial three minutes of an aviation firefighting response?

Ed postulated that the only way that this is possible is to equip the incident commander with a mental model that can be



Pic courtesy of The IAFPA

used as a template on which to base tactics. This *recognised primed decision making model* acts to help the incident commander make sense of what is, by its very nature, a dynamic, complex and time stressed situation. This concentrates on using the innate ability that we all have to use our experience to make sense of new situations and make use of the this information for decision making.

*This recognised primed decision making model acts to help the incident commander make sense of what is, by its very nature, a dynamic, complex and time stressed situation.*

The next paper was given by Bobby Shaub from E-One Trucks and dealt with the design of ARFF appliances. This fascinating talk gave an outline of the history of ARFF design, how it has progressed to the current state of the technology and, finally, a look at the future. Bobby showed how E-One has adapted its designs to face the modern range of demanding requirements from both regulator and customer alike – for example, in the increasingly stringent dynamic stability testing and emissions control restrictions. E-One trucks is continuing to develop its products, such as researching advanced driver training, man rated booms and fuel cell technology.

After lunch the programme resumed with Kim O'Neil giving a paper titled *Aircraft and Terminal Evacuation using Directional Sound Technology*. Kim's

paper highlighted the practical problems with evacuation in that people tend to disregard conventional exit signage and evacuate either by the way they entered or by the way they are facing. Conventional signage is usually placed at high level and can quickly become unusable in smoke. This has led to the loss of lives in what would otherwise have been survivable air crashes, for example in the Manchester air crash. Using directional Sound Technology this may have been averted. The technology uses directional sound transmitters to locate the positions of the exits, therefore allowing the easy identification of the exit even in smoke. Kim showed the audience the results from a series of tests using a Virgin A340 Airbus which demonstrated the value of the system.

The following paper was presented by Marco van Wijngaarden, the training programme manager for NIBRA, the Netherlands, entitled *Virtual Reality Training Programmes for Fire Service Officers and Managers*. The speaker gave a fascinating presentation on how virtual reality training programmes can

be used to train those responsible for managing a disaster situation. The benefits of the systems were shown and these were put into the context of the complete training environment where they are used. Marco's presentation explained the concepts of the use of virtual reality training and how it can be effectively and efficiently integrated into the overall training package for fire officers.

The final paper of the day was given by Gunnar J Kuepper, Chief of Operations with Emergency and Disaster Management Inc, Los Angeles, USA. The subject was entitled *Airport Centre Acts of Ultra Violence and terrorism Targeting Airports and Planes*. Gunnar's talk was a thought provoking and, at times, humorous, look at the present threats facing the aviation industry. The message is encapsulated in a quote from Martin Luther King: 'when evil men plot, good men must plan'. The paper put the problems faced by modern planners in the context of terrorist acts in aviation which have been faced over the last 40 years. Planning is the only effective response, thinking the unthinkable so that when the terrorist acts, the response can be timely, proportional and effective.

The first day closed, with the thread of the day's discussions drawn together by Ron Parry.

The second day began with very informative talk given by Ian and Martin from the Metropolitan Police's Counter Terrorist Office SO18. The subject was how the police prepare and train to counter the terrorist threat at London Heathrow Airport. Their discussion began by highlighting the enormous range of threats faced at the world's busiest international airport, ranging from catastrophic acts of terrorism to the works of environmental campaigners. The policy adopted by the Met is to



Pic courtesy of The IAFPA



deter, detect confront and, if necessary, react. This highlighted the amount of unseen work in intelligence and planning which must be undertaken to provide an effective counter to the ever present threat of terrorism.

*It was pointed out that this threat is a potential disaster which can seriously affect the financial viability of airports. This was illustrated by various examples of major fires that have occurred in airports.*

This presentation was followed by Russ Timpson, from the Fire Strategy Company, whose paper highlighted the ever present threat to airports from fire in the airport terminal environment. It was pointed out that this threat is a potential disaster which can seriously affect the financial viability of airports. This was illustrated by various examples of major fires that have occurred in airports. Far from being accidents, Russ made that case that with the creation of a successful fire strategy, careful planning and staff training, the potential for a fire to begin and then to cause serious damage can be mitigated. This can be done by a HAZOP style analysis of the terminal, which will capture the fire risks face in a terminal, place them in their economic setting and finally resolve how to produce effective measures to mitigate against the risk. This approach, typified by the Fire Summit training package, has won the prestigious' European strategic Risk Management

Training Course of the Year; in 2004.

The next paper returned to the theme of disaster planning and was given by Geoff Williams, QFSM, CIETecRI, ChFI, MIFireE., Deputy Firemaster Central Scotland Fire Brigade, UK. Geoff's paper entitled *TEMPEST- 'Thinking Smarter to Combat Terrorism'*, explained the concept of pre-planning to sustain airports critical assets prior, during and after a terrorist attack. This is done by a computer model to provide a decision making process which has been pre planned for the assets to be protected. It defines the habitual decision making process and considerations that will be encountered in an incident to create an appropriate habitual response for the scenario being considered.

The final paper of the conference was presented by David Herri-man, Head of Emergency Planning, Düsseldorf International Airport, and was entitled '*The Düsseldorf Airport Terminal Fire – the lessons learned.*' David described the events of April 11, 1996 which tragically killed 17 people and injured at least 80 others and then drew the lessons learned from the disaster. Following the fire the airport management was criticised for its total lack of planning. Since the fire the airport management has put measures into place to remedy the situation. Fixed fire safety has been provided in the form of compartmentation and a sprinkler system. Staff training has been introduced to enable any incident to be managed. Finally the importance of crisis management has been learnt, with procedures



Pic courtesy of The IAFPA

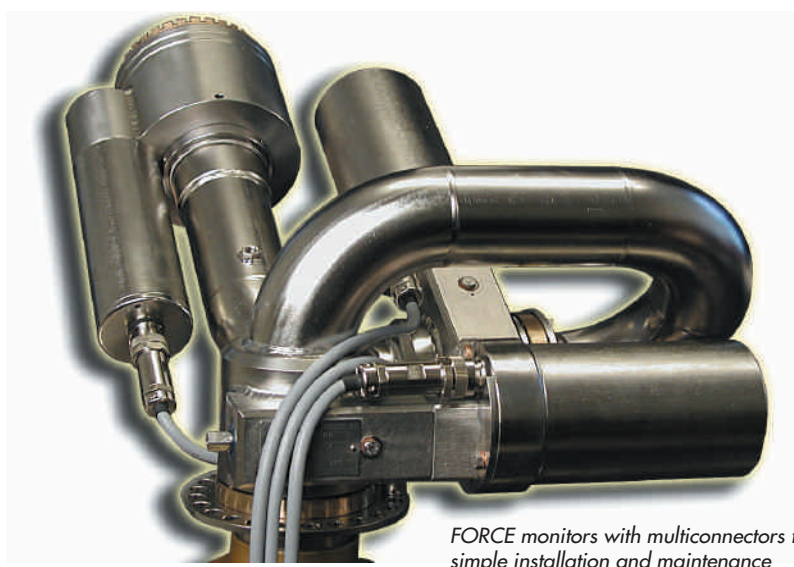
and plans put into place to deal with the disruption to business that a major incident can cause.

The conference was closed by Gary McDowall, Business Director of IAFPA. Gary drew together the themes of the conference. Although many of the delegates came from differing areas of the aviation safety industry, one central theme emerged: In order to prepare to protect the people who work in, travel in and protect the aviation industry, all those involved in protecting the industry must prepare for the unthinkable to happen. The only way to prepare effectively is to share information and ideas. Effective co-operation must begin at the planning stage and if done well will pay dividends should the unthinkable happen.

The conference was judged a success by the delegates. The speakers were all of the highest quality, providing entertaining and thought provoking papers on a professional manner. The quality of the venue was of the highest order and the hospitality shown by the Amsterdam Airport Schiphol Fire Service made for a very enjoyable event, this event is a must for anyone involved in the planning or response side of the aviation safety industry.



Pic courtesy of The IAFPA



FORCE monitors with multiconnectors for simple installation and maintenance

## UNIFIRE AB

### High tech monitors

Unifire AB was founded in 1969. The first customer for the newly started company was SAS, Scandinavian Airways, that used the Unifire nozzles for de-icing purposes.

During the 1970's and 1980 the company slowly grew and expanded the product range of nozzles. Product development focus was on the fire brigades, whilst the sales success developed mainly in the Marine and industrial markets.

Today Unifire AB supply nozzles to commercial ship owners all over the world. The Unifire nozzles can be found

on cruise ships in the Caribbean, in the Chinese sea and around the coasts of Europe. They are widely used on oilrigs around the world. Also the nozzles are part of the "standard" equipment on many European fire brigades. The Unifire V-Nozzles are also one of the most widely copied nozzle designs. Our V-nozzle patent expired in 1989.

#### NEW PRODUCT DEVELOPMENT

The market for relatively "low tech" products as nozzles is being challenged from all fronts. Over-establishment in the European and American markets, combined with aggressive, and increasingly competent Asian manufacturers is reducing the margins and making it hard to win new market shares.

#### PROGRAMMABLE REMOTE CONTROL MONITORS

To meet this new world Unifire AB decided to enter the high-tech monitor business. The FORCE MONITOR project was initiated three years ago. We very early found that there was a need in the market for smaller Stainless steel monitors than was currently available. Many applications required stainless steel because of environmental circumstances, such as salt or polluted water or aggressive and dirty industrial environments.

#### INTEGRATED GEARS AND NOZZLE MECHANICS

The truly unique features of the Unifire FORCE monitors are the supreme quality

worm gear drives. These exceptional gears are made of high precision 316 Stainless steel. The high efficiency of the gears reduces the power consumption, weight and size, whilst maintaining high turning velocity and high torque.

The newly developed INTEG 50 and INTEG 80 nozzles finally put a monitor nozzle on the market that is resistant to ice and dirt. Never again we have to see actuators that get stuck, or oil dripping hydraulic nozzles.

#### CANBUS COMMUNICATION

The other challenge of the project was the electronic controls. New micro-processor technology and miniaturized electronics made it possible to develop a state-of-the-art control system.

The serial communication of the CANBUS protocol is used to communicate between control-unit and CPU. This makes the system very flexible, multiple joysticks can be connected, network installation of the monitors is simple, reliable and low-cost. Vehicle installation and integration is very simple.

#### CONNECTIONS AND UPGRADES

All connection points are fitted with IP67 multi connectors. This makes installation very simple and also allows for simple exchange of components and simple upgrades. The control software is upgradeable from a standard PC via serial communication.

#### UNIQUE CONTROL FEATURES

The new FORCE monitors are supplied with a unique optical joystick. The progressive "slope" can be modified to fit individual customer requirements. As a standard the monitors comes with a "record-and-play" feature, meaning a movement pattern (up to 3 min) can be repeated automatically. The nozzle control is of a proportional type simulating twist-operation of a standard hand-line nozzle. The standard control unit can also control an electric valve, and has user-selectable parking position. The CPU can control up to 4 motors and 8 relays. The monitor control can thereby be made to control valves, lamps and other aux. features.

#### INTERNET PRESENTATION

The FORCE monitors has their own web-site. On [www.force-monitor.com](http://www.force-monitor.com) detailed technical information, videos, installation examples etc., is presented.



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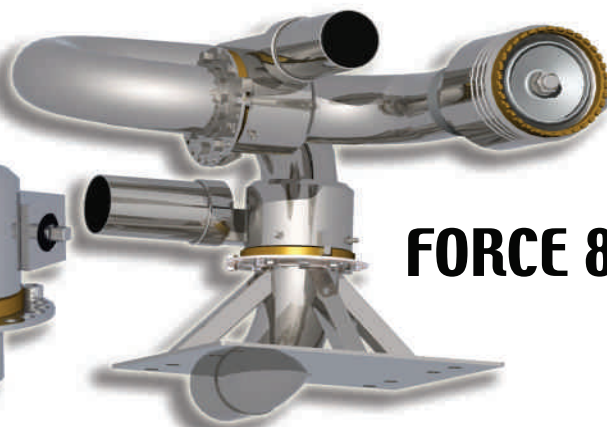
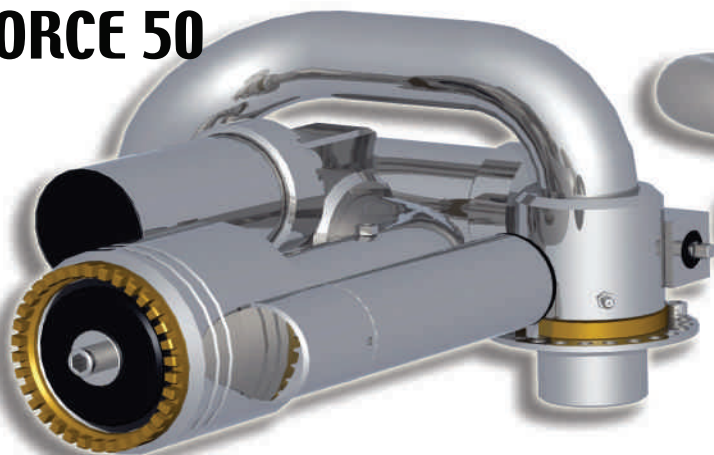
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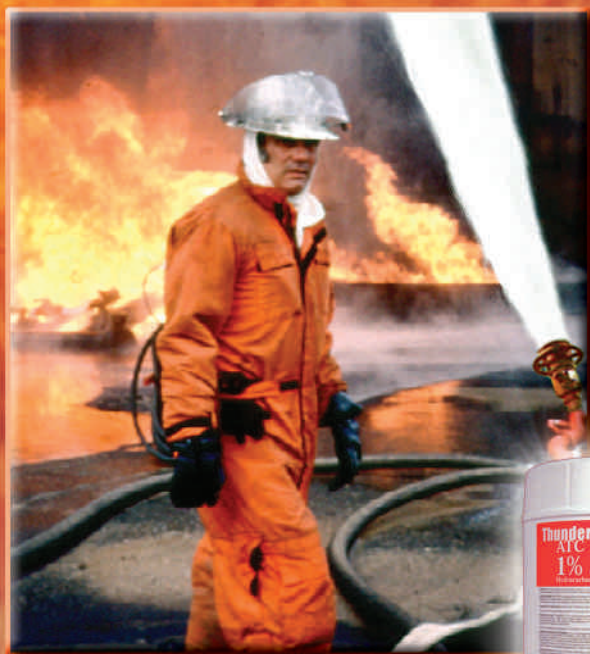


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Dwight lives in the South, Mitch to the North. Dwight circles the globe battling fires that engulf fuel storage tanks and oil fields. Mitch travels too, but mainly to visit laboratories and test facilities. Dwight Williams owns and operates Williams Fire & Hazard Control. Mitch Hubert is the senior chemist at the Ansul Fire Technology Center.

*So what do these two have in common?*

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# New DEFRA Report Has Implications For Foam Users

By Mike Willson of  
Angus Fire

THE UK GOVERNMENT DEPARTMENT of Environment, Food and Rural Affairs (DEFRA) has just published an in-depth study into the environmental risks and proposed reduction strategy for the chemical PerFluoroOctanyl Sulphonate (PFOS), which is used in many applications including fire fighting foam.

## 3M STOCKS UP TO DEC 2002 AND ANY SUBSEQUENTLY MIXED PRODUCTS ARE AFFECTED

Fluorochemicals containing or breaking down to PFOS were produced in Europe predominantly at the 3M™ plant in Belgium or manufactured in the Solberg Scandinavian AS licenced plant in Norway. Several other 3M licenced mixing plants around the world also produced PFOS based products, which were sold under the global 3M™ or Lightwater™ brands of AFFF and ATC™ AR-AFFF type foams. These products were manufactured until 3M's™ voluntary withdrawal from production, in May 2000, but unavoidably delayed until December 2002. All UK manufactured foam is entirely free of both PFOS

and PFOA (PerFluoroOctanoic Acid) in their formulations as they are entirely based on telomer derived fluorocarbon surfactants. These telomer fluorocarbon surfactants are produced by a more advanced and entirely different manufacturing process (telomerisation) compared to the 3M™ Simon Cell ElectroFluorination process. Consequently they have different chemical structures which do not contain or degrade to PFOS, nor it is believed to PFOA.

## PFOS CONFIRMED PBT

Scientific studies have shown PFOS to be a Persistent, Bioaccumulative and Toxic (PBT) chemical. DEFRA has therefore set an objective to achieve zero emissions of PFOS in the UK environment.

The DEFRA report has been conduct-

ed to EU guidelines and it was agreed that the UK Government should take the lead in Europe on this environmental issue. Involvement of other EU governments has been encouraged within the steering group, along with many other stakeholder groups including the UK BFPSA (British Fire Protection Systems Association).

The report was discussed recently at a European level and a public consultation phase is in progress in the UK, prior to further consideration of it becoming a legally binding policy document throughout the EU.

It is therefore a very important document. It aims to be fair, realistic, practical and workable for all foam users. The full report can be viewed/downloaded from the DEFRA website at <http://www.defra.gov.uk/environment/chemicals/pdf/pfos-riskstrategy.pdf>. Readers are encouraged to at least view the executive summary section.

## MAIN RECOMMENDATIONS

The main recommendations contained in the DEFRA PFOS Risk Reduction Strategy Report are summarised below to give foam users an insight into the main issues:

- PFOS (PerFluoroOctanyl Sulphonate) meets the EU criteria for PBT (Persistent, Bioaccumulative and Toxic) status.
- Zero emissions and/or cessation of use is the aim of any risk reduction measure.
- Any PFOS containing products must now be held in reserve.
- Any PFOS usage must be contained.

*The report was discussed recently at a European level and a public consultation phase is in progress in the UK, prior to further consideration of it becoming a legally binding policy document throughout the EU.*

# New DEFRA Report Has Implications For Foam Users

- The use of PFOS based foams for purposes other than use in an emergency is prohibited.
- PFOS containing products are not permitted to be released to wastewater treatment plants without Environment Agency agreement.
- All future disposal of PFOS is to be by high temperature incineration (HTI) only.
- All foams containing PFOS must be disposed of within 5 years.
- Telomer based foams represent an existing and technically feasible substitution but reductions in environmental risks compared to PFOS based foams are currently unquantified.
- There are concerns over alternative fluorine free products due to acute toxicity and potential emulsification with hydrocarbons (List 1 substances).
- This allows adequate time for better data on environmental and health risks of substitute telomer based and fluorine free foams to be generated.
- Groundwater Regulations (1998) already prohibit discharge of List 1 substances (including all organohalogen/fluorinated foams) onto or into ground with likelihood it will reach groundwater.

## IMMEDIATE DISPOSAL DEFERRED IN CERTAIN CONDITIONS

There is a 5 year delay that is conditional on a number of actions by civil Fire Authorities (FA) and other Mutual Aid (MA) partners in UK:

- FAs are to ensure their stocks of PFOS based foams are removed from active service and they are not used at incidents where firewater containment is not possible.

- FAs should EITHER destroy PFOS based foams immediately by HTI, OR trade with MAs to swap for their non-PFOS based stock.
- MAs are permitted to retain stock of PFOS based foams as part of reserves for a period of 5 years, whereupon all remaining PFOS based stock will be destroyed by HTI.
- If used during the 5 year period, contained fire waters are not permitted to wastewater without agreement of Environment Agency and application of emission controls.
- All future disposal of PFOS based foams is to be by HTI at recommended incineration sites.

Clearly PFOS products and those foams mixed into bulk storage with PFOS product will need to be replaced, but the report does not give any clear guidance on the way forward for foam users.

*Since foam fire fighting involves forceful application onto the hazardous area but the foam still needs to achieve swift fire control and extinction to minimise the risk of escalation, the threat to life, damage to property and other consequential losses including business interruption.*

## ARE TELOMER BASED PRODUCTS SAFE FOR CONTINUED USE?

The most logical and practical way forward is to replace PFOS containing products with a telomer based alternative which is likely to have lower fluorine levels than the 3M™ product and should be PFOS free. Fluorocarbon surfactants are an important chemical group in fire fighting foams that give unique benefits to provide the high performance levels required by firefighters using modern application techniques. The US EPA has taken telomers out of their Enforceable Consent Agreement for PFOS on the basis of the latest scientific research data, and has confirmed that telomers are safe for continued use.

## BENEFITS OF FLUOROCARBON SURFACTANTS TAKEN FOR GRANTED – NOT EASILY REPLACED!

Firefighters take the performance levels offered by fluorocarbon surfactants for granted after relying on them for the last 40 years. Since foam fire fighting involves forceful application onto the hazardous area but the foam still needs to achieve swift fire control and extinction to minimise the risk of escalation, the threat to life, damage to property and other consequential losses including business interruption. Life safety demands high performance foam fire-fighting products which can provide fast extinction and good post-fire security even when low application rates and



challenging conditions prevail. Modern fluorine free foams are in their infancy and while suitable for some niche applications are by no means up to the job of wide ranging and deep seated fire fighting. We should not forget that foam users have needed the benefits of Fluorine containing foams to:

- provide rapid fire control and extinction
- provide efficient and effective fire control at minimal application rates
- save lives (workers, public, firefighters)
- protect fire-fighters from danger of injury (burns, heat exhaustion)
- minimise risk of escalation into other areas
- reduce threat to high value assets and production plant
- minimise consequential losses of the fire
- minimise the use of foam and water resources
- minimise fuel pick-up in the foam blanket
- minimise risks of hydrocarbon pollution in the aquatic environment
- minimise risk of containment area over-flow
- minimise run-off and subsequent off-site impact

These are still key requirements to get the job done safely and efficiently by most firefighters for most applications. Telomer chemistry allows more efficient use of fluorine especially in fluoroprotein (FP) type foams which typically have only 10% of the fluorine content of a 3x3 AR-AFFF! Modern FPs represent maximum efficiency in the usage of fluorine coupled with proven high performance for deep seated hydrocarbon fire fighting.

#### FLUORINE FREE ALTERNATIVES NOT UP TO THE MARK

Current alternative technologies are not capable of providing equivalent performance across a broad range of applications, although some progress has been made for niche applications. One also has to question advice from companies who only have a single product line or restricted product range to offer. If they do not convince you their product is best they will lose the sale, so expect a strongly biased view from these manufacturers/suppliers. Leading manu-

facturers like Angus Fire with a full product range are more balanced in their advice. They are also investing significantly into research to find and develop the new ground breaking technologies that will meet your requirements in future and lead to higher performing fluorine free products. However, the challenges of this task should not be underestimated as there are no readily available "drop-in" replacements for the unique fluorinated chemical group. Current technology does not provide adequate answers, and those selecting it are in for some surprises when protection of their facilities are on the line in a big fire scenario.

#### Some of the drawbacks of these fluorine free products from an operational standpoint are:

- most based entirely on synthetic detergent, which is the most acutely toxic ingredient in foams
- LC<sub>50</sub> values of 20mg/L detergent in water will kill a wide range of aquatic organisms including fish
- Need to be applied gently through aspirated equipment to avoid collapse on volatile fuels
- Emulsify with hydrocarbon fuels and carry them past fuel separators and out into the environment as a potentially serious pollution incident.

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# New DEFRA Report Has Implications For Foam Users

Hydrocarbons themselves are List 1 substances under the UK Groundwater Regulations 1998, so even though the foam does not contain fluorine it can still cause List 1 substances to be released into the environment.

- Detergent foams generally perform less well in seawater.
- Detergent based products collapse more quickly when subjected to fierce radiant heat and flame attack
- Detergent based products are prone to sudden flashbacks and re-ignition.
- Detergent based fluorine free foams do not provide adequate levels of post fire security for use on deep seated fires, nor do they offer adequate protection against a wide range of polar solvent chemicals like industrial Alcohols.
- Such products are still only suited for Class A fires and certain niche Class B applications.

## STUDIES SHOW TELOMERS SUITABLE FOR CONTINUED EMERGENCY USE

PFOS is a known PBT substance and needs to be controlled, but other fluorinated products like telomers and PFOA are also now under investigation. All fluorochemicals are persistent in the environment but legitimate concerns are also being raised about any potentially bioaccumulative and/or toxic characteristics. Detailed scientific studies are underway with detailed environmental fate and behaviour studies carried out by prominent research scientists and the leading fluorochemical manufacturer, DuPont. All the tests conducted so far suggest that telomer based fluorocarbon surfactants while persistent, are neither bioaccumulative nor toxic. It will be some time until conclusive studies can verify that this is a correct conclusion.

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## EPA CONFIRMS PFOA AND TELOMERS SAFE TO USE

The US Environmental Protection Agency has made a fundamental distinction between PFOS and PFOA/Telomers and has put legislation in place to control the use of PFOS and encourage a voluntary phase out.

- PFOS is the subject of a Toxic Substances Control Act (TSCA) to prevent the manufacture and importation of PFOS based chemicals into the USA.
- A Significant New Use Rule (SNUR) has been imposed to restrict, control or prevent any potential new use for PFOS based materials that may be proposed in the future.
- An Enforceable Consent Agreement (ECA) has been implemented to ensure anyone using PFOS on the grounds of no alternative technologies must verify this and gain consent for continued use. This only affects certain military uses. Following detailed data provided to the US EPA, they were able to justify removing PFOA from this consent agreement and confirm both PFOA and telomer based fluorochemicals are safe for continued use.
- Flexibility may be the key. The world's first UL listed high fluidity natural protein based foam without the use of thick water soluble polymers has an amazingly wide range of applications in one fluid concentrate (Niagara 1-3 AR-FFFP). It can be used for:
  - Class A wetting agent applications at 0.2%-1%
  - Compressed Air Foam system (CAFS) applications at 0.6-1%
  - shallow hydrocarbon spills at just 1%
  - deep seated hydrocarbon fires at 3%
  - fires involving a wide range of polar solvent chemicals at 3%
  - fires involving a range of noxious chemicals at medium expansion at 3-6%

## BEST WAY FORWARD

The best way forward is to retain all the benefits of telomer based foams like FP70 Plus, Petroseal and Niagara for emergency incident use, while utilising a modern F3 (Fluorine Free Foam) product for training and system testing. These modern F3 training foams mimic



## *Training foams can be used for equipment calibration, system commissioning and personnel training with the run-off passing through a sewage treatment plant after fuel separation and on into groundwater, rivers or the sea.*

the proportioning and foam quality characteristics of these operational telomer based foams but without any list I or List II substances present.

In this way the training foams can be used for equipment calibration, system commissioning and personnel training with the run-off passing through a sewage treatment plant after fuel separation and on into groundwater, rivers or the sea.

### MODERN F3 TRAINING FOAMS LEAD THE WAY

The most advanced area of fluorine

free technology is F3 mimic foams:

- TF3 a modern 3% Training Foam specifically designed to mimic natural protein based products like Petro-seal, Niagara and FP70/FP70 Plus.
- TF6 a modern 6% Training Foam concentrate specifically designed to mimic protein based 6% foams, specifically in aviation.
- TFAL 3 a modern 3% Training Foam mimics the polymer containing natural products like Alcolac AR-FFFF.
- Synthetic detergent based AR-FFFFs like Tridol ATF are mimicked by TFA 3.

- Standard AFFF 3% and 6% foams are suitably mimicked by a new product called Trainol.

Polymer containing detergent based UL listed front-line operational fluorine free fire fighting foams with ICAO approval and EN 1568 certification like Syndura are only suitable for certain specific niche applications where fluorocarbon surfactants are prevented from being used. They do not represent "cure-alls" for diverse fire applications.

### RESEARCHING FOR A BETTER FUTURE

At the forefront of research towards radically new technologies are leading companies of global stature. They realise that new thinking will be required to achieve equivalent levels of fire performance to current fluorine containing foams. These will not use fluorinated chemicals which are themselves a unique chemical group without a "drop-in" replacement, so progress is slower than they would like.



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# Future Trends in Indu



Pic courtesy of E-One

**SOME EXPERTS SAY THAT** this year's record prices for crude oil mark the beginning of an era when the demand for petroleum products threatens to outpace the supply. Customers in Europe and North America already find themselves competing with a growing number of users in Japan, China, and other countries. At the same time, oil companies around the world are scrambling to expand their production facilities to get the oil out of the ground and turn it into a wide range of finished products. It's a situation that is expected to be with us for decades to come and it has triggered a wide range of trends that are changing the petrochemical industry.

**S**ome of these trends will change the size and location of future oil refineries, shipping terminals, and related chemical plants as the industry regroups to better meet the needs of the new marketplace. In turn, these trends will also help define the type of industrial fire apparatus required to protect those facilities.

## LARGER, MORE EFFICIENT REFINERIES

It used to be that there were only a limited number of oil producers that supplied a limited number of customers. The United States was, and still is, one of the biggest customers. Oil was plentiful, and operating costs were low. What the United States didn't produce

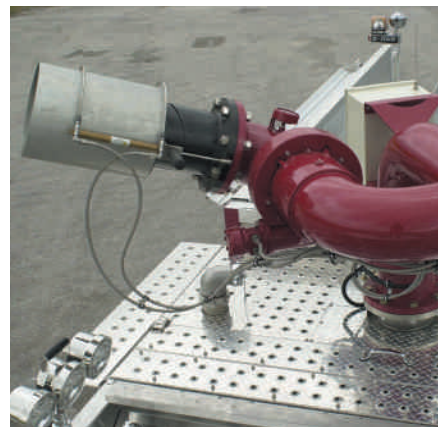
**By Peter Trampe**

themselves, they imported from other countries. Competition for the seemingly endless flow of oil was minimal.

Today's situation is more complex, with dozens of countries producing oil and even more countries wanting to use it. Competition is greater, and the oil is harder to obtain. To remain competitive and keep prices in check, many older refineries around the world have been closed, further restricting supply. For example, in the United States more than 200 older, mostly smaller, refineries have been closed since the early 1980s because changes in technology and tougher environmental restrictions have made them unprofitable. In China, which is potentially one of the largest users of petroleum products in the world, many of their older refineries were shut down five years ago after it was decided that they could not effectively compete in the changing world market.

In response to the new market conditions, there has been a growing trend to build larger and more efficient refineries in areas where the demand is high and the costs of construction and operation are favorable. New refineries are currently under construction in many countries of Asia, Africa, and South America with even more to follow. The United States, which was once a worldwide supplier of petroleum products, has fallen behind this trend and can now barely meet their own needs. Despite the overwhelming demand for more capacity, oil companies have been reluctant to build

*In response to the new market conditions, there has been a growing trend to build larger and more efficient refineries in areas where the demand is high and the costs of construction and operation are favorable.*



Pic courtesy of E-One



# Industrial Fire Apparatus

new refineries in the United States because of tough environmental restrictions, high construction costs, and long lead times — in fact, there hasn't been a major new refinery constructed there in twenty years.

Instead, new refineries are springing up all around the world. As they do, oil companies find that they can gain significant economic advantages by locating related industries nearby. While the refineries are busy pumping out thousands of gallons of fuels and lubricants for consumers, they can also supply a wide range of petrochemical feedstocks to chemical plants within the same industrial complex. Natural gas, which was once burned off as a waste product, can be liquefied and shipped. Nearby port and pipeline facilities can carry products to and from the refineries to meet the needs of eager customers at home and abroad.

The result has been the worldwide growth of new, more-efficient oil refineries surrounded by a wide variety of related industries to form large petrochemical processing facilities that rival many cities in terms of area and economic importance.

## ... AND LARGER, MORE-EFFICIENT APPARATUS

One of the natural outcomes of having larger facilities is the need for increased fire protection at these sites. The plants are larger, the storage facilities are larger, and the input and output flowrates are higher. In the ports and along the connecting ship channels, the number of ships is greater. If a fire should occur anywhere within these sprawling complexes, it would require larger volumes and higher flowrates of fire suppression foam.

Several of these refinery mega-complexes already exist in the United States and other countries. To deal with the need for increased fire protection, the fire brigades at many of these sites have found that high-capacity foam pumpers equipped with high-capacity monitors provide the best and most efficient way to fight large-scale fires.

A typical high-capacity industrial foam pumper usually has a 500+ horse-



*Pic courtesy of E-One*

power diesel engine with a pump capable of delivering 9,460 to 13,250 liters per minute (2,500 to 3,500 US gallons per minute) of water or foam solution when lifting from a static source and up to 17,040 liters per minute (4,500 US gallons per minute) when pumping from a pressurized source, such as a hydrant. The pumper carries 3,785 liters (1,000 US gallons) or more of foam concentrate in an onboard tank and is equipped with a high-capacity monitor capable of delivering up to 15,140 liters per minute (4,000 US gallons per minute) of finished foam product.

The high-capacity foam monitor is especially important when fighting fires in large-diameter storage tanks, where there is a very large surface area of burning liquid that needs to be covered quickly with a thick blanket of foam.

Industrial brigades that use these big monitors say the streams have a greater reach and can be delivered with greater accuracy than is possible with streams from smaller monitors. The greater reach and accuracy allows firefighters to operate at greater stand-off distances from the fire for protection against radiant heat. Some foam monitors are available with optional features such as radio remote controls to allow operations from more protected locations. Other monitors include various dry chemical injection systems to increase the fire-fighting effectiveness of the foam streams on pressurized and flowing fuel fires.

To provide an adequate water supply to support foam monitor operations, high-capacity foam pumpers usually carry several hundred meters of



*Pic courtesy of E-One*



*Pic courtesy of E-One*

12.7-centimeter (5-inch) diameter hose that can be connected to high-volume hydrant systems on the site. For even greater delivery rates, some brigades now use 18.4-centimeter (7.25-inch) diameter hose to provide additional water without having to lay multiple lines.

On congested sites where access roads are narrow, foam pumpers can be equipped with rear-mounted pumps rated up to 11,350 liters per minute (3,000 US gallons per minute). Mounting the pump at the rear of the vehicle permits a shorter wheelbase for better maneuverability, and spreading the hose connections across the back of the body results in a shorter pump installation that provides even more room for hose and equipment.

#### NEW FOAM SYSTEMS

High-capacity foam pumpers can also take advantage of several new developments in foam and foam systems that make application faster and easier, as well as provide significantly longer operating times from a single tankful.

One of the most recent foam developments is a new alcohol-resistant AFFF foam concentrate called ThunderStorm 1x3 ATC, which was specifically developed by Ansul Incorporated and Williams Fire & Hazard Control for use on oil refinery fires. The new foam can be applied at a 3% ratio for fighting fires involving polar solvents — such as acetone, methanol, and methyl ethyl ketone — and the same foam can also be applied at a 1% ratio for fighting fires involving hydrocarbons — such as gasoline, jet fuel, and naphtha. Because the foam can be used on the two most common types of flammable liquid fires that might occur in an oil refinery, it simplifies the storage and application requirements for firefighting personnel. And when the foam is used on hydrocarbon fires at the very low 1% ratio, it allows mobile high-capacity foam pumpers to

stay in operation up to three times longer than if they used more typical 3% foam.

The new ThunderStorm 1x3 ATC foam is especially effective at handling fires in storage tanks containing highly volatile premium gasoline. The foam spreads across the surface of the burning liquid quickly and seals against the walls of the

tank to form an effective vapor barrier. It also has excellent fuel shedding properties, which means that large streams of foam can be projected over the side of the tank and into the burning liquid without breaking up the foam blanket.

To make it easier and faster to switch application rates with this new foam, Williams Fire and Hazard Control designed a new proportioning valve for use with their Hot Shot I and Hot Shot II foam systems. Unlike some high-capacity foam proportioning systems that are designed to inject foam concentrate at a fixed ratio, the new valve is infinitely adjustable to inject foam over a wide range of ratios. This allows firefighters to quickly change the proportioning ratio after they arrive on the scene to handle the specific flammable liquid involved.

#### FEWER PEOPLE

Another advantage of using high-capacity foam pumpers is that they allow a fire brigade to provide protection with fewer personnel. Instead of responding with two or three smaller pumpers, each staffed with its own driver and crew, the brigade can use a single high-capacity pumper that produces the same amount of foam with a single driver and crew. And if the fire brigade is stationed

within the refinery itself, instead of having to respond from a nearby town, then they do not have to deal with the vehicle length, width, and weight restrictions that apply on roads in the surrounding area.

The continued growth of new, large refinery facilities around the world gives fire brigades even more opportunities to reduce personnel. For example, in large industrial complexes, where dozens of petrochemical plants are grouped on the same site, fire protection can often be provided by a single fire brigade operating high-capacity foam apparatus out of one or two centralized stations that protect the entire complex, rather than having separate smaller apparatus stationed at each individual plant. This arrangement is already used in many refinery complexes in the United States and several other countries, and its use is expected to grow as brigades find they can provide the same protection with fewer, but larger, foam pumpers and fewer people.

#### CONTINUED GROWTH IN THE FUTURE

Although oil industry experts may disagree on the timing of events in the future, they all agree that the demand for petroleum products is going to continue to grow for many years. And with that growth there will be a need for newer, larger, and more-efficient oil refineries and related industries in countries all around the world.

To match that growth, the number of industrial fire brigades will also grow and will meet the needs for fire protection at these larger facilities with larger, more-efficient, high-capacity foam pumpers equipped with the latest technological advances in pumps, monitors, foam systems, and fire suppression agents.



*Pic courtesy of E-One*



# Fire and Rescue Training





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# Confined Space Rescue Training

By Charlie McClung,  
Ndip AEC Natal

IN 22 YEARS OF being a Rescue Paramedic there are few situations I have not been involved in, traffic collisions, assaults, mountain and aviation rescues, were all common place as Africa was inherently a violent as well as topographically challenging arena for every rescue worker, and multi skilled paramedics were an essential component of the Emergency Services.

There is one situation that really challenges those skills, confined space rescue. Here in the face of unseen hazards and extremely difficult working conditions the risks to rescuer and casualty are like no other. It is not only the hazards that challenge us but often a combination of rescue techniques that are required to safely extricate the injured from their predicament.

So what is confined space rescue? Essentially I believe it is removing a casualty from a situation where there is insufficient space to either access, extricate or treat the casualty effectively without intervention of specialist equipment or rescue techniques.

Such incidents could include:

- Pits or bore holes
- Trenches
- Silos
- Sewers and underground water pipes
- Collapsed structures
- Holds of ships
- Tanks of trucks or railway cars (cleaners)
- Petroleum Refineries
- Cellars

No matter what the incident the dangers to rescuers should not be underestimated at any cost. The situation is already perilous as it is without

us compounding it by making rash decisions that defy logic in an effort to rescue a casualty, who may have succumbed already.

While speed is demanded by the public, and often we are at the receiving end of a myriad of abuse due to our “appearance” of doing nothing, they have little idea of the extremely dangerous and often life threatening situation we are about to enter. Statistics indicate that 60 percent of all confined space fatalities are rescuers, DO NOT become one of them.

In order to highlight some of the difficulties involved with confined space rescue I would like to share two incidents with you.

- A grain silo rescue.
- Ship rescue.

## GRAIN SILO RESCUE

It was about 14.00h one afternoon when we were called to a milling company about 60km away from our base in Gaborone, Botswana as someone had been injured in the grain silo.

Upon our arrival entry from the ground was not possible and our only access point was 50m up via a ladder and through a hole in the silo wall just wide enough for a person to get through. The ladder, attached to the silo wall was secured by a cage so using it for a packaged stretcher/spinal board was impossible. Egress was already a concern.

My initial size-up was from above, the casualty lay on the floor of the silo, it was fairly dark inside but ventilation holes gave us enough light. The silo

*The situation is already perilous as it is without us compounding it by making rash decisions that defy logic in an effort to rescue a casualty, who may have succumbed already.*

## Confined Space Rescue Training

was fairly well ventilated so the risk of explosion was minimal. Access to the floor of the silo was gained by climbing down an identical ladder on the inside of the silo, sliding down the pile of grain about 3m and onto the silo floor. The spinal board worked very well as a platform for this.

There were no doors onto the floor of the silo so I initially thought of maybe assisting the patient to climb out with us if his injuries enabled it, however my hopes were dashed when we did our primary survey.

He was scooping grain into the crusher with a spade and pushed the spade in too deep, the crusher pulled the spade with him still attached into the jaws and in the process amputated both arms mid-shaft humerous, both arms were gone pulled into the crusher. I was amazed he was still alive.

His vital signs were unbelievably relatively good, helping us to climb out was going to be a problem and in any event, I felt that he may have incurred a spinal injury following his collision with the crusher whilst being dragged in. Our treatment included, bandaging both stumps, IV access using the external jugular vein, C-collar and spinal

## Do's and Don'ts

### Do's

- Gather as much information as you can from the caller and updates from the control centre prior to your arrival, this will help you select the correct equipment before you leave and may save time later.
  - Once on scene Set up a command post and select the team according to expertise and experience, this type of rescue needs personnel who have been there before and are well aware of the risks.
  - Take time to do a thorough size-up and correlate the information you have to what you see and detect. Determine if this is a body recovery or a rescue as soon as possible as it will affect your approach.
  - Use all the resources available to you. Monitoring equipment such as O<sub>2</sub> and Explosion meters if you have them use them, it will lower the risk of a potentially hazardous situation. Place the monitoring equipment into the area some time before entry is gained. If continuous monitoring is required leave the equipment in place for the duration of the rescue.
  - For pits and drain pipes it may be an idea to use a search camera (if available) to look around first if possible prior to committing personnel. Physical hazards can be identified and prepared for, by taking the correct equipment with the entry team.
  - If this equipment is not available to you follow the better safe than sorry principle, ie. always wear full protective gear (SCBA) when entering a subterranean space which
- due to lack of oxygen or the presence of toxic gasses may be hazardous to an unprotected rescuer.
  - Prior to entry, isolate all power going into the building, electrocution is a hazard to all rescuers and may have been the cause of the rescue itself.
  - Initial access and egress routes should be evaluated and alternative routes especially egress planned for the eventuality that plan A fails or needs adjustment.
  - Equipment for casualty access and removal should accompany the rescue team, based on information from the initial call, not be called for later when plan A is exhausted, these could include ropes and winches, lifting gear etc.
  - To the public a fire fighter is this 2m lad built like a shed capable of anything, while this is good, he don't fit into confined spaces too well, having rescuers smaller in stature in the team reaps benefits when small people need to crawl into extra small areas.
  - Be flexible, put your plan into action but be prepared to change it if the scene changes. Have at least one preferably two backup plans in place and brief the remaining team members on them. This will aid the transfer from one plan to another.
  - Multi-skill the team, in most cases several techniques using an array of equipment is often required to safely remove a casualty from a confined space, make sure that the team is skilled in the use of all the equipment you use on a daily basis.

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## Don'ts

- Don't rush, while time is essential for the casualty, we do not want to become part of the problem and increase the statistics. An effective size-up will assist you greatly in this regard.
- Never unnecessarily risk the lives of your team members in order to effect a speedy solution to the problem
- Short cuts are not an option here, they WILL cost lives.
- Don't rely on one source of information gather as much information from as many people and as many angles as possible.
- Never send inexperienced or insufficiently trained personnel into this type of situation. In almost every case medical staff are required to manage the patient however in some countries they are not trained in the use of SCBA or long lines for air supply. Rescue techniques such as rope work and the use of breaking and entering equipment are not their every day tasks and they could freeze or panic at a crucial moment during the rescue.
- As a team leader, don't ever lose touch with the overall situation, tunnel vision could cost lives and waste precious time, stay back and allow the team to work, consult regularly with your safety officer, keeping your finger on the pulse of the rescue.
- Don't ever try to take on a situation that you cannot cope with, with your current resources. Never be too proud to call for help, if specialist equipment such as gas detection equipment or explosion meters are required and you don't have them, request assistance and delay entry of the team until the area has been declared safe. The safety of you and your team may be compromised by your decision.

immobilisation on a spine board.

Egress was now a serious problem. Initially we thought of cutting the safety bars around the ladder by our initial point of access and using ropes to lift him out, however upon measurement this was not going to be possible as the hole was too small for man and board.

An alternative way out was found by using the vents at ground level in the silo (used to remove grain), more space had to be made by digging away the concrete slabs making up the vent and the patient/board just made it through. The whole rescue took two hours.

It is often not the dangerous rescues that challenge us, even the relatively simple ones, can produce difficult circumstances. I often wonder how long it would have taken if we had had to widen then use our access route, using ropes to lift then lower the stretcher.

## SHIP RESCUE

In this case we were called to a ship in the Durban Harbour, where one of the crew had been injured in the hold.

Upon my arrival we descended using the gangways of the ship into the lower reaches of the aft hold. We could

be effective the area around him was too small. I made the decision to place him on a back board and slide him out to an area where we could effectively manage his injuries. After treating him, wrapping his mashed legs in glad wrap, and bandages we applied the PASG as an air splint, two IV's and oxygen, he needed to get to surgery urgently, we needed to find a way out.

Egress was not going to be easy as our access route was definitely not suitable as it was very narrow and the stairwells had barely enough room for us, never mind a badly injured sailor in a basket stretcher.

Our options were, either to use ropes or use the docks' crane to exit the hold. We used the latter and the crane ride up and out was uneventful but thwart with danger as there are no sides on the platform so we needed to be well secured before lifting.

## LESSONS LEARNED

When we think of confined space rescue most people envisage rescuing an injured casualty from an area the size of a 44 gallon drum. While this is probably a worst case scenario, sometimes a situation that looks easy suddenly becomes unbelievably difficult, especially if you have limited resources or your casualties' injuries warrant extreme care during the extrication process.

I have learned from experience that these types of situations should never be rushed into. Lateral thinking is essential as a team leader and always

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*Training is essential, equipment and techniques change over time, the team should be kept abreast of all the latest techniques and equipment used in this demanding field.*

have a plan B or even C in case of the situation becoming unmanageable.

#### CONCLUSION

Confined space rescue is a daunting task, not every rescuer is comfortable in the ever decreasing size of a cave or tunnel. It takes nerves of steel and an ice cool head when the going gets tight and there is ever increasing pressure from above for a happy conclusion to the rescue.

Team members should be selected very carefully, based on temperament and experience. Training is essential, equipment and techniques change over time, the team should be kept abreast of all the latest techniques and equipment used in this demanding field. Realistic ongoing training is essential in this regard, every team member should be confident and comfortable with every piece of equipment in the arsenal.

Above all BE SAFE, allowing your head to rule your heart is key to the success of the operation, the rescue of Jessica McClure was the finest example of this. Hearts were breaking on the surface but the guys just stuck at it. If you allow your emotions to get away from you, your decision making capabilities will be affected and your team could suffer as a result.

Of course we all have feelings, after all we are all humans, however it is the ability of the commander and indeed the team to focus on the task at hand, without letting emotion compromise their judgement that will succeed above all.



**Charlie McClung  
Ndip AEC Natal**

Charlie has been a rescue paramedic for 22 years, his skills were honed in the military and the Kwazulu Natal townships in South Africa as a National Diploma Paramedic before moving to Botswana where he was chief para-

medic for an aviation rescue service. At present he runs a training school in Botswana and provides specialist rescue assistance the local emergency services. Part of his portfolio is a chief instructor for ICET in the Netherlands, providing specialist rescue training to rescue teams worldwide.





150 m flexi 350 River boom deployed by Boom Vane System on River Visla in Poland

## ORC AB and BOHUS INNOVATION AB

### The Boom Vane – revolutionizing fast water Oil Spill Response

The Sweden based companies ORC AB and BOHUS INNOVATION AB have together launched two systems for fighting oil spills in fast flowing waters and sweeping in harbours and at sea.

The *Boom Vane* is a device for oil boom deployment in rivers and other waterways. This powerful yet light and handy tool makes spill control and recovery possible without the need for boats, anchors or fixed installations of any kind. The *Boom Vane* can be operated in waters with heavy traffic since the control rudder allows for fast and effortless system retrieval from mid stream. As a fast-water tool, the *Boom Vane* works equally well when deployed off a vessel – in this mode of operation the vessel's progress through the water powers the *Boom Vane*.

Oil spill response operations are notably difficult in rivers with strong current and river vessel traffic – indeed, many professionals claim such missions impossible. Considering typical response time margins allowed for river spills in relation to the mobilisation time and resources required for conventional land-

or vessel-based boom systems, a timely response is not a logistic possibility – with the *Boom Vane* it is.

The *Boom Vane* is constructed as a cascade of vertical wings mounted in a rectangular frame. Powered by the current flow the *Boom Vane* – held by a single mooring line only – swings out towards the opposite shore with the oil boom in tow.

The *BoomVane* is deployed with an angle of approx. 45° to the current while the oil boom is set at approx. 11° to the same, running from the *BoomVane* down-stream back to the shore-side recovery point [Circus].

However, the system does not require the operators to trim line/angle, as the *Boom Vane*'s fixed line will configure the system to correct angle when launched.

The *BoomVane* oil spill response system is based on the following components:

- *BoomVane* complete with 150m 12mm Dyneema Line system.
- *FLEXI 350 River* 105m oil boom adapted with vertical support lattices.

- Optional: *FLEXI "High Speed" boom* for speeds above 3 knots
- *River Circus* skimmer system.
- *Foilex Mini skimmer*

and is designed for operations in flowing waters of velocities between 1 and 5 knots.

The unique *BoomVane* system allows for very fast spill response – two men may have the system in operation within 30 minutes of arrival at the response site.

#### Vessel application

In coastal and offshore sweep operations, the *Boom Vane* offers important advantages compared to both two-vessel U-sweep or a sweep vessel with rigid outrigger arms. The *Boom Vane*'s high speed and wave-action stability, coupled with the elasticity inherent in the system, allows for unparalleled sweep width and equipment durability in different vessel sweep modes. As the towing vessel requires no more than a sturdy cleat, the *Boom Vane* is the ultimate boom deployment tool for Vessel of Opportunity Skimming Systems (VOSS).

#### New Walboom "Clean Sweep"

The new self expanding boom is designed to withstand the tremendous forces that occur during sweeping operations in severe conditions. The new "Clean Sweep" boom is specially designed to be towed by the *Boom Vane*. The advantage to use this kind of boom is that it can even be used for corraling and as a fence. It is stored on a vertical winder and the deploying time is reduced to a minimum. The recovery of the boom is fast and easy, and 200m of boom can be stored on the winder. With 200m of boom, 100m on each leg, we achieve approx. 100m of sweeping width.

By inducing a drag at the opening in the middle of the boom – for example by hooking up a skimmer vessel trailing behind – the U-shape of the boom sweep is 'straightened' out to that of a "V", which allows for higher sweep speeds without losing oil under the boom.

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# The Refinery Terminal



**By Jason Flores,  
RTFC Firefighter, and  
John David Lowe,  
RTFC Division Chief**

respective fields of instruction. The RTFC Training Academy specializes in “custom tailored” courses which are built to meet the unique hazards and specific training needs of its individual customers.

## INFRASTRUCTURE

The RTFC Training Academy is situated on approximately 9 acres of land and is equipped with a variety of Live Fire, Hazardous Materials and rescue training props. A 220,000 gallon water tank provides fire water flow to the training field via two Detroit Diesel 3,000 GPM fire pumps. A 5,000 gallon kerosene tank and a 10,000 gallon propane storage tank provides fuel for fire training props and all fire water run off is captured and treated, on site, in the facilities 250,000 gallon waster water treatment plant. The Training field has a variety of common industrial and municipal fire hydrants, sprinkler systems and foam systems available for use. Classrooms are available on site, with seating capacity of up to 100 students. All classrooms are equipped with modern audio/visual training capabilities. Restroom, rehab and showering facilities are also located on site, and the RTFC Training Academy



## Brief History and overview of the Refinery Terminal Fire Company

The Refinery Terminal Fire Company (RTFC) was established in 1948, in the wake of the Texas City, Texas disaster, and today is the largest non-profit industrial firefighting group in the United States. RTFC currently has over 100 full time career firefighters, which operate 6 fire stations 365 days a year (protecting its membership's 70 plus industrial facilities). As a company RTFC has responded to thousands of fires, hazardous materials releases, rescues and medical emergencies throughout the oil, petrochemical, pipeline and port facilities of its members. All career RTFC firefighters are highly trained in industrial firefighting, storage tank firefighting, interior structural firefighting and marine firefighting; as well as hazardous material responses, emergency medical responses, confined space rescue, high angle rescue and trench rescue response. RTFC also provides a number of special services such as: inspections, testing and maintenance of equipment; fire & rescue pre-planning; fire or rescue emergency “stand by” services and consulting services. In addition, RTFC operates a \$5.5 million training center which is used to train its worldwide clientele in all aspects of emergency response and preparedness.

### OVERVIEW OF THE \$5.5 MILLION TRAINING FACILITY

The RTFC Training Academy annually trains customers throughout the United States and the world in all aspects of emergency response. In the past five years the RTFC Training Academy has conducted a total of over 150,000 hours of training to customers not only from Texas, but also the continental

United States as well as, clients from as far away as Canada, Mexico, Malaysia, Venezuela, Brazil, Africa and Saudi Arabia. All RTFC Training Academy Instructors are career firefighters, who “practice what they teach” in their daily work assignments. In addition, the RTFC Training Academy has a variety of “Adjunct” instructors, from across the United States and the United Kingdom, whom are considered experts in their



# Fire Company (RTFC)

has a fully stocked and functional medical clinic manned by a certified EMS staff member.

## TRAINING PROGRAMS AND COURSES

### ● Industrial Firefighting (Process Unit Firefighting)

The Process Unit Fire Fighting Program offers students with intense “hands on” live firefighting training that resembles the specifics hazardous that may occur in a particular customer’s facility. The program includes live LPG and flammable liquid fires, offensive and defensive strategies, as well as, day light and night fire attack scenarios.

### ● Marine Firefighting

RTFC is also responsible for the protection of the Port of Corpus Christi Authority with any fire that may take place on vessels, docks or other facilities in the ship channel. The Port of Corpus Christi Firefighting Barge is operated by RTFC personnel and is capable of pumping 8,000 GPM of water and carries 15,000 gallons of foam concentrate. Therefore, RTFC personnel are well trained with the newest innovations in marine firefighting and as a result, can offer a wide variety of instruction pertaining to marine vessel and facility related emergencies. The RTFC Training Academy is equipped with \$500,000 marine firefighting prop, with both LPG and flammable liquid fire capabilities, to make these training courses as realistic as possible. The RTFC Training Academy is a USCG approved training facility.

### ● Structural Firefighting

RTFC personnel are trained to respond to structures buildings and warehouses that are owned and operated by its member companies. As a result, the RTFC Training Academy can offer a variety of training courses that encompass all types of structural firefighting responsibilities. These



courses are custom built to the client’s needs and include such topics as: exterior fire attacks, apparatus placement, interior fire attacks, ladder operations, occupant searches, stand pipe and hose pack operations, ventilation operations, overhaul operations, “Rapid Intervention” (RIT) training and much more.

### ● High Angle and Confined Space Technical Rescue

The RTFC Training Academy rescue courses regularly train individuals to respond to a wide variety of industrial, municipal and other types of emergencies. These courses encompass training on equipment identification, care and use; rope anchors, rigging and hauling system building techniques, patient access, packaging and extrication techniques as well, as rescuer responsibilities and safety practices.

### ● Trench Collapse Rescue

Because RTFC is also responsible for responding to any trench rescue incidents that may occur within its membership, the RTFC Training Academy is equipped with a trench rescue trailer, fully stocked with hydraulic shoring and digging equipment, as well as, having highly qualified personnel to present trench collapse training courses. All training





## TRAINING PROPS

### ● Industrial Process Unit Prop

The RTFC Industrial Process Unit training prop is used to create worse case scenarios that may occur within industry and is capable of providing a variety of LPG and flammable liquid fires on equipment, such as: process towers, piping, vertical product pumps, horizontal product pumps, heat exchangers, fin fans, storage tanks and other common components of the modern chemical and refining processes. Evolutions often involve all aspects of fire and hazardous materials responses and can include: Incident Command, apparatus placement, fixed fire systems, foam attacks, water run-off management, fire water management, offensive and defensive strategies, search and rescue and many more. Students gain first hand knowledge in techniques for hose handling, fire stream applications, use of portable and fixed equipment, foam application, communications and teamwork.

### ● Pump Alley Prop

This training prop is a series of 4 horizontal product pumps, located within the Industrial Process Unit, and is capable of producing LPG and flammable liquid fires on one or all

courses are designed to use actual trenches that are purposely collapsed during the scenarios and must be rapidly shored, using appropriate techniques, prior to rescuers entering and extricating the patient.

### ● Hazardous Materials

The RTFC Training Academy's goal is to train individuals on how to appropriately respond to a release of a hazardous material(s). These courses provide training relevant to the 29 CFR 1910.120 and NFPA 472 standards and are tailored to the HAZWOPER, First Responder, Technician and Refresher levels. The multitude of training props available for these course allows the Training Academy to supply real life scenarios that meet the some of the following objectives: surveying the hazardous materials from a safe location, estimation of the potential harm, identifying defensive options, as well as, assuming the more aggressive roles of determining the appropriateness of personal protective equipment, decon setup, plugging, patching or otherwise stopping the release of a hazardous substance for a variety containers, rail cars, pipelines, process systems and others.

### ● Aircraft Rescue Firefighting (ARFF)

These courses are designed to give the structural firefighter a basic knowledge of aircraft firefighting principles. Personnel who may respond to an aircraft incident, on or off an airport site, will benefit from

these courses, which focus on the strategy and tactics of general, commercial and military aircraft incidents. Some of the topics will include aircraft and airport familiarization, firefighting and rescue tactics, and hazardous materials. The RTFC Training Academy is a FAA approved training facility.

### ● Emergency Medical Training

All RTFC instructors are Texas Dept. of Health EMT-B or Paramedic certified and capable of presenting a variety of EMS courses, from First Aid, Refresher or Certification courses.





of the pumps simultaneously. Students learn how to approach these fires set up portable equipment and successfully isolate block valves on multiple pieces of equipment.

#### ● **Truck Loading Terminal Prop**

This training prop consists of multiple flange leaks and pipe ruptures which spill to a holding area that may be ignited. This type of training allows students to learn the dangers and techniques associated with emergencies involving the loading or unloading of tankers.

#### ● **Rail Car Prop**

The rail car and rail track training props are used for a variety of Hazardous Materials and confined space rescue training scenarios and can be used to teach students the identification procedures and tactics involved in these types of emergencies.

#### ● **Two level fire structure Prop**

This building can be used to simulate either house, office or apartment fires and consists of three rooms upstairs and three rooms downstairs, all capable of burning Class A materials for firefighting. This structure provides intense heat and zero visibility, while allowing students to practice search and rescue, attack, standpipe, ventilation and overhaul operations.

#### ● **Ship/Barge Prop**

The simulated ship/barge training prop consist of multiple decks with



two diesel engines, a boiler front, a bilge, various pumps, steep ladders, a bridge, storage compartments and a “Universal Ship-to-Shore” water connection. This training prop is capable of produce LPG and flammable liquid fires and allows students to master techniques for search and rescue, access and egress, fire water and foam applications and a variety of other tasks associated with modern marine vessel emergencies. This training prop has been approved by the USCG as a training facility for “Marine Firefighting for Land based Firefighters”.

#### ● **Aircraft Prop**

The aircraft training prop is designed to simulate an aircraft that has encountered a crash or fire and is capable of producing flammable liquid engine fires as well as, Class A material fuselage fires. This training prop allows students to perform search and rescue and fire attack operations on realistic vehicle, complete with a passenger seating compartment. This training prop has been approved by the FAA as an “Aircraft Crash Fire and Rescue” training facility.

#### ● **High Angle and Confined Space Rescue Training Props**

The RTFC Training Academy has multiple props available, in which to conduct high angle and confined space rescue operations. These props include: pipes, vessels, towers, reactors, rail cars, tanks and drums all of

which are equipped with a variety of horizontal and vertical access entry configurations to meet 29 CFR 1910.136 regulations. In addition, the RTFC Training Academy regularly conducts rescue training courses on board the U.S.S. *Lexington* Aircraft Carrier Museum. This decommissioned aircraft carrier provides a unique training environment with over 14,000 confined spaces, most of which are in parts of the ship which not accessible to tourists. Call RTFC today and you can enjoy “Rescue Training at the Beach”, courtesy of our association with the U.S.S. *Lexington* Museum.



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# The Real Thing

By Matt Youson

**Live fire training rigs are a growth market in which solutions are increasingly bespoke, flexible and environmentally acceptable**

*Pic courtesy of Simulation*

tempo to training regimes has seen strong growth in the demand for live-fire test rigs.

Since the late 1990s the market has seen exponential growth. The perceived threat from terrorism is an obvious contributory factor with many of the long-standing markets for hot rigs ostensibly vulnerable to attack, though there are many catalysts for growth to be found in much less malign circumstances: the volume increase in low-cost civil aviation and the development and upgrading of airport facilities to accommodate it for example.

Whether the application is civil or military and based in aviation, marine, industrial or another industry, the core technologies to be found in live-fire simulators are essentially identical. The bespoke nature of the work, however, ensures that any desired configuration of the outer shell can be catered for: from a Boeing 757 to a light aircraft; a

THE LAST THREE YEARS have inevitably seen the emergency services come under greater scrutiny from government, media and public alike and while fire chiefs will argue that their level of readiness has always been elevated, most will also agree that extra funding post 9/11 has allowed an intensification of the training cycle, pushing the boundaries of preparation to new levels.

Emergencies by their very nature are difficult to predict, a fact that fire fighters around the globe seek to counter with incessant, repetitive training. While such preparation is the cornerstone of professionalism on which all fire fighting services rely, this throws up distinctive challenges for specialist crews.

Most emergency services around the globe subscribe to the axiom that there is no substitute for experience. The cliché is entirely valid but creates its own problems for those fire fighters training for a once-in-a-lifetime situation. Unlike domestic fire fighting where a continuous stream of real world situations serves to hone the skills of the crew, experience for a specialist crew – for example tasked to fight fires in aircraft, ships or petrochemical installations – has to come in the form of simulation. The task for training providers is to make that simulation as realistic as possible.

The crews staffing the fire station at

airports, on board ship etc., are training for a situation that may never arise. Nevertheless they must be ready for a variety of scenarios and repetitive training is the only method to adequately prepare them. Each faces a unique set of characteristics for which generic firefighting techniques would be inadequate, making conventional training methods of little use. An increasing

*The perceived threat from terrorism is an obvious contributory factor with many of the longstanding markets for hot rigs ostensibly vulnerable to attack.*

# The Real Thing



*Pic courtesy of Simulation*

complete firehouse to a fire attack unit; or a ship's compartment through to a whole multi-deck ship. Extremely common are hybrid configurations, such as the multi-purpose military aircraft simulator designed for the UK Ministry of Defence and installed at the MoD's Fire Service Central Training Establishment (FSCTE) at Manston, Kent. The unit, believed to be the largest hot fire aircraft training simulator within the MoD features a main fuselage based on that of a wide-bodied civil aircraft but also incorporates elements of a Tornado fighter aircraft, a Hercules transport plane and, bizarrely, elements of a Sea King helicopter.

The majority of live-fire rigs have a basic structure composed of substantially reinforced steel plate. Thick walled box sections are used for the support construction and are extensively braced. The rig is then fitted out with various fuel burners that simulate a variety of possible fires – or scenarios as the fire crews call them. Increasingly common, particularly for aviation applications, is the commissioning of a dual fuel rig. Bodies responsible for safety certification, for example the UK's Civil Aviation Authority (CAA), frequently require fire fighters to train with 'realistic' fuel fires. In the case of the CAA the obligation is for these training simulations – using kerosene – to be carried out at least once a quarter. While training fire fighters to combat pressurised fuel-fed fires is served most realistically by using fuels of this type, such methods carry an environmental burden that is becoming increasingly unacceptable.

The many ecological problems associated with the use of carbonaceous fuels make it the bugbear of the Green lobby,

and so outside of the quarterly requirements the industry is leaning in favour of training with liquefied petroleum gas fires. While LPG lacks the thick black smoke and atomised fuel cloud characteristics of kerosene, its relatively clean burn with little or no smoke output makes it more acceptable to environmentalists. By and large fire chiefs have acquiesced to the need for compromise and therefore airport authorities keen to dispel perceptions of environmental recklessness see the dual-fuel rig as an eminently attractive option.

The simulator at Nottingham East Midland Airport in the UK is a good example of the breed. Dimensionally modelled on a Boeing 757, the rig features seven LPG- and eight kerosene-fuelled scenarios. It will simulate an underwing or rear fuselage engine fire, underwing and undercarriage fires and several scenarios in the main fuselage.



*Pic courtesy of Simulation*

Kerosene is delivered from a pressure vessel, the pressurisation of which is obtained by using breathing apparatus cylinders that are recharged with the fire stations own compressor. The pressurised kerosene is then distributed via a manifold once the master control console has been enabled and all the safety systems operated correctly. LPG is stored at pressure in its liquid form in two 4,000-litre vessels. All the scenarios have a pilot ignition system and these are ignited using a lighting lance prior to the exercise commencing. LPG in its vapour phase drawn off from the top of the storage vessels is used as the fuel for the pilot lights.

While the rigs themselves are necessarily robust, the nature of an intensive training regime does little to promote longevity. The solution employed by one leading rig developer is an innovative water-cooling system designed to extend the service life of its equipment by pre-drenching the structure with a protective layer of water. At Nottingham the drenching system that protects the fuselage uses water pumped from one of the airport fire fighting vehicles. The 10,000-litre capacity of the tender translates into an operating time on the rig of something over ten minutes. The piped system terminates in a series of spray nozzles on top of the fuselage which establish a film of water around the body, while similar nozzles spray the top and/or outer surfaces of the wing and wing engine.

The water-drench system requires 30 seconds to pre-drench the rig prior to the running of a scenario and a post cooling time of one minute. With individual burns limited to three minutes (in a real incident the fire-fighters would expect to have a fire under control in less time) it uses water at a rate that will



allow a minimum of two exercises to be run back to back from one tender.

In one of the latest rigs to enter service the role of water-supply is very different. The National Maritime Training Centre in Ireland has spent US\$100 million building a world-class naval fire training facility that will provide comprehensive training to over 800 students per year. The Centre, due to officially open in October 2004, is already drawing delegates from all over the world to view the wide-ranging training facility which includes one of the most innovative and realistic ships simulators available for naval fire suppression training anywhere in the world.

Located in Ringaskiddy, County Cork, the Ship Fire Training and Damage Limitation Unit is a combined rig that will allow trainees to perform fire and rescue training as well as damage limitation and repair to a breached engine room. The rig simulates three decks of a ship and has been designed to provide an engine room together with accommodation areas including mess and sleeping facilities. Of the four possible pressurized fuel fires simulated by the rig, three (engine, a cooker and a bed fire) burn natural gas while the fourth, again based in the engine room, is a kerosene fire.

Via a series of internal corridors and external walkways the fire simulator connects to the damage limitation unit where five installed fracture points allow instructors to simulate engine room water ingress based on wall fractures, hatch seal failure and high level fire main fractures.

The market for live-fire simulation equipment has been worth an estimated billion US dollars over the last five years and projections for the second half of the decade suggest this figure will be superseded. The nature of the business, however, is set to change, with hot-training rigs moving into smaller and more specialised niches. The high capital expenditure



*Pic courtesy of Simulation*

required sees equipment designers increasingly looking at new ways to allay the high up-front cap-ex costs of commissioning equipment.

Alongside the innovative solutions that have come along such as a Transportable Aircraft Fire Training Simulator and the Mobile Fire Truck which can be transported from venue to venue, many fire services are now looking into possibilities of developing a modular approach to fire ground provision whereby a long term plan sees an initial rig installed with a master control panel and fuel storage and delivery systems capable of accommodating a total of three, four or five further rigs in the future.



*Pic courtesy of Simulation*

## Real Fuels. Real-life Situations.

Offering one of the finest emergency response programs and training facilities in the world, the University of Nevada, Reno Fire Science Academy presents specialized instructional programs in:

- Industrial Fire Fighting
- Crisis and Emergency Management
- Incident Command and Response
- Aircraft Rescue and Fire Fighting (ARFF)
- Hazardous Materials
- Instructor and Train-the-Trainer

**FSA** FIRE SCIENCE ACADEMY  
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E-mail: fireacademy@unr.edu • Web: fireacademy.unr.edu



## THE NEW AGE IN GAS DETECTION



BW Technologies has set a new industry benchmark for performance, value and ease-of-use with the GasAlertMicro multi-gas detector. The ultra-compact and durable GasAlertMicro offers the most advanced features of any confined space gas detector on the market today, at the industry's most economical purchase price.

Simultaneously displaying oxygen, hydrogen sulfide, carbon monoxide and combustibles present, GasAlertMicro delivers cutting-edge protection and is ideally suited to a wide range of applications, including hazmat response, confined space entry, search and rescue, and post-inspection fire safety.

GasAlertMicro's features include high-output audible/visual/vibrator alarms; low, high, TWA and STEL alarm settings; a large, alphanumeric LCD; two LEL measuring units (0-100% LEL and 0-5% by volume methane); a built-in concussion-proof boot; and optional data-logging capabilities.

Field-selectable user options allow GasAlertMicro to be customized to virtually any environment. Calibration due-dates and alarm settings can be configured to meet specific industry requirements, and the pass code protect function ensures tamper-proof operation by preventing unauthorized users from accessing calibration options.

GasAlertMicro's flexible power options (two AA alkaline or two AA NiMH batteries) reduce downtime and provide up to 16 hours of continuous use.

At just 211 grams (7.4 oz), GasAlertMicro truly is more for less.

**For more information, please contact:**

**BW Technologies**

**Tel: 1 403 248 9226**

**Website: [www.gasmonitors.com](http://www.gasmonitors.com)**

## GASMAN KEEPS GAS MONITORING SIMPLE



The new Gasman personal gas monitor is small, light and easy to use in the toughest industrial environments. Weighing between just 105-130g (depending on sensor type), it is extremely durable, with high impact resistance and ingress protection to IP65/67. When a hazardous gas is detected the device alerts the user with a loud 95 dBA alarm, an extremely bright red/blue visual warning, and also by vibrating.

The Gasman is so small it can easily fit into a top pocket or clip onto a belt or lapel. It features true, single-button control and fully interchangeable i-module intelligent sensors for oxygen, toxic and flammable gas monitoring. An easy to read backlit LCD display ensures clear viewing of all gas readings, alarm conditions and battery life.

There are two levels of instantaneous alarm, with time-weighted average alarms available for toxic versions. Data and event logging are available as standard, and there is a built-in 30 day advance warning when calibration is due.

Two versions of the Gasman are available: a rechargeable unit with a lithium-ion battery for 12 hours' operation for use with all gas types, and a unit powered by a long-life non-rechargeable battery for toxic gas and oxygen detection.

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## IMPROVED CAFS TECHNOLOGY FROM HALE PRODUCTS EUROPE



The Godiva World Series pump with integrated Compressed Air Foam (CAFS) has now been upgraded to incorporate the latest in electronic foam proportioning systems. The CAFS is a compact package mounted on the rear of the pump comprising of a compressor, FoamLogix 2.1 electronic proportioning unit and Hale X-mixer system and full instrument panel.

The FoamLogix 2.1A proportioner provides computer controlled accuracy of foam injection across a 0.1 to 9.9% range. A Class1 flow sensor constantly monitors water discharge to maintain the required foam injection ratio. The FoamLogix system features a compact control unit mounted in the pump panel with precise push button control and display of water flow rate, foam injection ratio, total water flowed and total foam concentrate used. A bar graph indicates the system capacity when in operation. The system has an operational range of 4 to 10 bar and a relief valve protects the foam pump from over-pressurisation.

The CAFS control now includes an incremental air ratio control with indicator display to provide infinitely variable wet or dry foam consistency and the option to select non-CAFS foam if required.

The comprehensive pump instrument panel now features high visibility Class1 foam and water tank level readouts, joystick type pump speed control with pre-set idle option, engine status warning lights and an emergency stop button. The entire unit is mounted on an integral anti-vibration cradle complete with drain connections for ease of OEM installation.

The benefits of CAFS are increasingly recognised as -

- A more efficient way to fight fires with reduced knock down times
- Reduced water usage and damage
- Reduced environmental impact
- Increased media projection

The Godiva World Series pump with CAFS represents a major step forward in fire fighting technology providing enhanced performance and operator control.

**For more information, please contact:**

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**Email: [admin\\_haleuk@idexcorp.com](mailto:admin_haleuk@idexcorp.com)**

## COMPACT GAS DETECTION IN NEW DRAEGER X-AM 3000



Compact and light in weight, the new Draeger X-am 3000 is an innovative 3 or 4 gas warning device. Providing reliable monitoring of H<sub>2</sub>S, CO, O<sub>2</sub> and combustible gases and vapours in ambient air, it is ideal for use in any application requiring portable

gas detection, including confined space.

Featuring state of the art electronics as well as Draeger sensors for a fast, accurate response to changing gas concentrations, the X-am 3000 is easy to use. Utilising simple three-button operation, it also boasts straightforward menu selection and a large display for measurement identification. The precalibrated electrochemical sensors and the catalytic sensor are automatically recognised and provide precise and reliable measuring results.

Rugged in design and protected against dust and water as standard, it offers reliable operation in all environments. Incorporating a scratch resistant display to ensure that gas concentrations can be easily read, it is also available with an optional rubber-boot to provide additional protection from mechanical and impact damage.



In addition to audible and visual alarms, a vibrating alarm is integrated in the instrument. The functionality and battery status are monitored continuously and will, if necessary, generate an alarm.

**For more information, please contact:**  
**Draeger Safety UK Limited**  
**Tel: 01670 352891**  
**Fax: 01670 356266**



The International Centre for Emergency techniques (ICET) is a specialist of world renown in the development of multi-disciplinary rescue training and consultancy programmes. ICET created the Systematic Approach to Victim Entrapment Rescue, SAVER™. This method is a truly interactive and universal approach to this demanding form of rescue.

ICET's consultancy department has assisted numerous local and national governments, as well NGO's in developing programmes to establish, support and upgrade emergency response networks. Under its RENU™ programme ICET has worked in countries as diverse as India, Argentina, Russian Federation, Belgium, the Netherlands and Turkey.

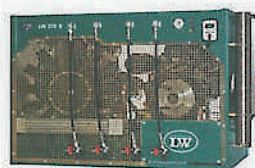
Recently, the SAVER Foundation incorporated the SAVER approach for further research and development. Emergency Medicine Prof. Dr. Marc Sabbe (Brussels) is Chairman of the Foundation.

Today, ICET is an international provider of technical assistance and training and the international representative of SAVER. In 2003, SAVER released a CD Rom of the basic SAVER course and on line examination. The English version of the CD Rom is expected to be released in later this year. It can already be ordered at a pre-registration price of €48,50 less 20% at [info@savertraining.org](mailto:info@savertraining.org).

ICET most recently introduced training course is called "Command and Coordination for incident commanders". During this course both virtual (Diabolo VR) and realistic scenarios are used to present the participant with a variety of leadership challenges. The course was recently taken by senior officers from the Malaysians Fire and Rescue Department, with international fire and rescue veteran Joe Bishop, one of the ground layers of the INSARAG guidelines, as a course director.

**For more information, please contact:**  
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**Fax: + 31 (0) 162 51 65 60**

## LENHARDT & WAGNER EXTEND RANGE



German high pressure compressor manufacturers Lenhardt & Wagner GmbH (commonly known as L&W) have continued to extend their range of HP BA compressors. The range includes electric, petrol and diesel driven units with capacities ranging from 5.5 – 46 cfm (160 – 1300 lpm).

The latest addition to the sound insulated range of compressors is the LW 570 ES, a 4 stage, 4 cylinder, 20 cfm unit (570 lpm) with 20 HP (15 kW) drive (64 dB[A] at 1m). The low rpm and over sized components result in a reliable compressor providing excellent service at an affordable price. This compressor is also available in a 420 bar (6000 psi) version and as open units either with electric drive or with a water cooled Yanmar diesel drive for mobile applications.

L&W filling panels for BA are well designed with interesting features including self venting lever operated filling valves which can be serviced in position. The venting occurs inside the panel, reducing the ambient noise levels, and can be further reduced with

simple silencers or even routed outside the building if desired.

For air quality monitoring, L&W offers a controller for monitoring moisture content in HP BA systems as they run. The L&W Puracon can be fitted as an option to a newly ordered unit or installed as a retrofit on existing installations to monitor the state of the BA filtration unit. The installation is possible without altering the existing filter or compressor controls, a port is available for shutting down the compressor should the moisture exceed international standards.

For 2005 an O<sub>2</sub> and CO<sub>2</sub> dynamic monitoring system for compressors is planned for release following market demand and recent EU legislation.

L&W also have an extensive range of high pressure refrigeration dryers for oil and moisture removal before the final filter, this extends the life of the filter and is especially useful in warm climates or where logistics for spares are difficult.

L&W has an extensive network of distributors for service and spares and have their own office in Singapore that covers the Asian market.

**For more information, please contact:**  
**Lenhardt & Wagner GmbH**  
**Website: [www.lenhardt-wagner.de](http://www.lenhardt-wagner.de)**  
**Tel: +49 (0) 625154849**

## EXXONMOBIL OPTS FOR TYCO'S NEW ROUGH TERRAIN FIRE MONITOR



ExxonMobil has placed an order for no fewer than 35 of Tyco Fire and Security's new Macron Cobra RTV low-cost, rough terrain, four-wheel fire monitors. The fog/jet monitor was developed to meet ExxonMobil's specific needs and is designed to operate efficiently in all weather conditions and in every conceivable rough terrain environment.

The order followed a fast-track product development programme at Tyco's Fire Suppression Product's operation in Great Yarmouth and proving trials at ExxonMobil's facility in Fife, Scotland.

The new lightweight Macron Cobra RTV combines what is described as "exceptional throw characteristics" with optimum delivery of water or foam either in a solid jet or a spray pattern. Robustly constructed using mild steel for the trailer and highly durable, non-corrosive, welded stainless steel and bronze for the monitor, it weighs just 72kg. The capacity can be easily adjusted to match site conditions and deliver water at up to 3,700 litres a minute at 10bar with 360-degree rotation and elevation spanning from plus ten degrees to plus 55 degrees.

Designed by Tyco engineers for fast deployment and stability when in operation, the new Cobra RTV allows single-handed operation with easy to use controls.

As standard, the premium-build specification includes independent swivel suspension roller bearings that are a major boost to the Cobra RTV's manoeuvrability over uneven or potholed surfaces, and manual wheel locking on the two rear wheels. The Cobra RTV also incorporates a locking monitor elevation handle, a detachable trailer handle, and twin instantaneous manifold inlets with spring-loaded non-return valves and integral check valves that allow either single or twin feed. Hose baskets on either side of the monitor can each accommodate up to 20 metres of the recommended hose, the Macron Viking layflat hose.

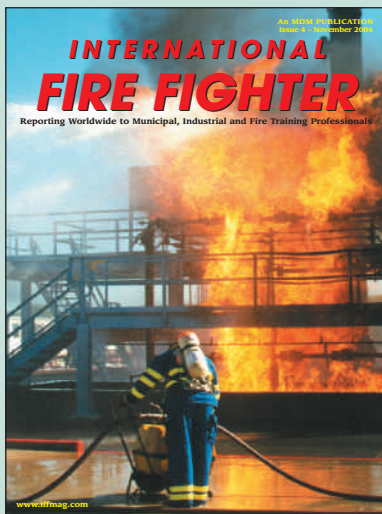
The Macron Cobra RTV can be factory-fitted with a number of optional features, including foam-filled tyres in place of the standard pneumatic tyres. A self-inducing model is also available, and a salt water resistant model with a stainless steel trailer body has been developed for marine applications.

**For more information, please contact:**  
**Macron Safety Systems (UK) Limited**  
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**Website: [www.macron-safety.com](http://www.macron-safety.com)**  
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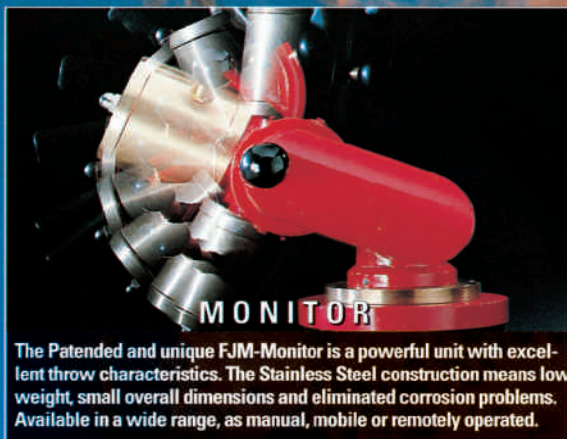
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